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THE WPPSI: AN EMPIRICAL EVALUATION WITH A BRITISH SA[illegible]

BY W. YULE, M. BERGER, S. BUTLE[illegible] [illegible]M AND J. TIZARD*

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SUMMARY. The Wechsler Pre-School and [illegible]ary Scale of Intelligence is examined. In an empirical study, 150 children, average age 5 years 5 months, in their second term of schooling on the Isle of Wight, were tested. The results are presented and suggestions are made as to how these data could be interpreted when this test is used with British children.

I.—INTRODUCTION.

THE Wechsler Pre-School and Primary Scale of Intelligence (WPPSI) was published in the USA in 1967 and became available in Britain in the Autumn of that year. It is a new scale designed to measure the 'intelligence' of children aged 4 to 6½ years, and is similar in many respects to the WISC. Since this test appears to fill a long felt gap in the child psychologist's armoury, it was decided to carry out an empirical evaluation of the battery with 150 5-year-olds living on the Isle of Wight, in order to test the applicability of the scale with British children, and to try out certain substitutions for some obvious 'Americanisms' contained in this scale. Such a move was felt to have obvious advantages over mere *a priori* changes made in the scale, as had been made with the WISC (British Psychological Society, 1955), although obviously this is far inferior to a complete re-standardization such as was recently carried out on the WISC (Scottish Council for Research in Education, 1967).

This paper seeks to examine the new scale critically, to propose certain changes in wording and to report on the use of the scale with a sample of British children.

II.—THE WPPSI.

(1) *The development of the scale.*

Wechsler reports that there were frequent requests for a downward revision of the WISC, and that "there was a growing awareness of the desirability of an intelligence scale that would more adequately appraise the abilities of the pre-school child" (Wechsler, 1967). Clinical experience (Beldoch, 1963) and the Scottish study also showed that the WISC was too difficult below the age of 6: in particular, an insufficient number of items at the floor of the test made it unreliable to use with young children or those of low 'intelligence.'

After three years spent investigating how far down WISC-type items could be extended, the prototype battery for the WPPSI was established. Four years of age was settled on as a suitable floor for the new test.

(2) *Content of the test.*

The WPPSI consists of eleven tests, six Verbal (of which one is supplementary) and five Performance:

Verbal.	Performance.
Information.	Animal House.*
Vocabulary.	Picture Completion.
Arithmetic.	Mazes.
Similarities.	Geometric Design.*
Comprehension.	Block Design.
(Sentences).*	

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The three starred tests are new ones; the remainder are similar in content to their WISC name-sakes. Animal House replaces Coding, and can be construed as a concrete version of the earlier test in which the child has to place a cylinder of the appropriate colour (the 'house') in the hole in front of each animal. Wechsler claims, without any empirical support (see below), that this test can be repeated at the end of the testing to get a measure of learning ability. Geometric Design is a ten item version of that old favourite, form copying, where the child is asked to copy a circle, square, etc., from line drawings. Sentences, the supplementary verbal test, requires the child to repeat verbatim sentences of increasing length. This replaces the Digit Span subtest, but was not used in establishing the original norms.

(3) *The Normative Sample.*

The test was standardized during 1963-1966 on a stratified quota sample considered to be representative of the US population aged 4 to 6½ years. In all, 1,200 children were tested, 100 boys and 100 girls at each half-year from 4 to 6½. Four major geographic regions were sampled, the proper proportions of urban-rural children according to the 1960 census were selected, as were the correct proportions of white and non-white children. Finally, the sample was also stratified by the occupation of the father.

Thus, determined efforts were made to ensure that the WPPSI was standardized on a sample representative of the total US population. The resulting sample was slightly under-representative of Social Class I (professional, technical and kindred workers), and slightly over-representative of Social Class II (managers, officials and proprietors), perhaps reflecting the latitude in selection allowed individual testers. Otherwise the standardization of the WPPSI must surely rank among the nearest yet to satisfy the requirements of the APA test standards (American Psychological Association, 1966).

(4) *Reliabilities.*

Reliabilities are reported in terms of a corrected split-half correlation for all subtests except Animal House where an immediate retest was performed. This, in fact, gave the lowest reliability of 0·77 among all age groups, the others ranging from 0·81 to 0·87. The reliability of the Verbal IQ is given as 0·94, that for Performance IQ as 0·93, and that for the Full Scale IQ as 0·96. Even allowing for the fact that split-half reliabilities tend to be higher than any other measures, these values are quite satisfactory for individual clinical use. However, no inter-rater reliabilities are reported. This is particularly unfortunate in the case of Geometric Design where considerable judgment is called for on the part of the scorer (see below, and Yule and Berger, in preparation).

Test-retest reliability is quoted at 0·86 for the Verbal Scale, 0·89 for the Performance Scale and 0·92 for the Full Scale, obtained from retesting 50 children in the age range 5¼ to 5¾ over an average of 11 weeks. Bearing in mind that marked cognitive changes are found in many young children, particularly in response to the additional experience provided at school-entry, further retest studies will have to be undertaken.

(5) *Validities.*

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The WPPSI manual continues the tradition of other Wechsler Tests (Littell, 1960) by failing to provide anything but the barest evidence of validity. In the only study reported, 98 children between the ages of 5 years and 6 years 1 month were tested on the WPPSI together with the Stanford-Binet L-M, the Peabody Picture Vocabulary Test, Form A, and the Pictorial Test of Intelligence. The correlations were modest: 0·75 between WPPSI, FS and Binet L-M, 0·58 between WPPSI, FS and Peabody, and 0·64 between WPPSI, FS and Pictorial Test. All four means were within 4 IQ points. As Wechsler argues (p. 35), these sorts of correlations do not indicate that the scales are interchangeable. In view of recent criticisms of the Stanford-Binet L-M (Berger, 1968; Phillips and Bannon, 1968) this may not be a disadvantage.

The paucity of validity data at this stage does not allow the user to interpret a child's score on the WPPSI in anything other than a statistical manner. The 'Intelligence Quotient' derived from the test results merely indicates the child's standing with respect to the American standardization sample. In particular, the quotients do not yet carry any predictive inferences for educational usage.

(5) (i) *'Verbal-Performance' Discrepancies.*

Although the WPPSI adheres to the grouping of the tests into Verbal and Performance Scales, Wechsler in no way considers that these represent different kinds of intelligence (Wechsler, 1967, p. 2). There is no evidence at this stage that statistically abnormal (i.e., infrequently occurring) differences are clinically meaningful, or that any other differences between groups of sub-tests are so. These again are problems which require careful investigation.

(5) (ii) *Animal House retest as an index of learning ability.*

As mentioned above, Wechsler suggests that some " qualitative evaluation of the child's ability to learn a simple task" might be made on the basis of his retest score on Animal House. In a footnote, he goes on to state that (p. 11), " one may expect that level of performance on Animal House will correlate with a child's rate of learning in school." Such comments are easily misconstrued and are potentially misleading. The assessment and prediction of 'learning ability' and 'learning rate' are complex problems which presuppose exhaustive validation studies. Wechsler's own suggestions are unsupported by any evidence of validity and there is no evidence that any consideration has been given to the possible multiple determinants of performance on this subtest. Similarly, the suggestion that " a very poor performance on Animal House will, at times, be associated with organic deficit " should be regarded as an unconfirmed hypothesis.

The obvious importance of predicting 'learning ability' from scores on intelligence tests necessitates a careful consideration of the difficulties associated with such prediction. It can be inferred from data in the WPPSI manual that at each age-level there is an increase in average raw-score following retest on Animal House (Table 23, p. 105). For the given method of scoring, the extent of increase appears to be negatively correlated with increasing age. Examination of Tables 21 (Scaled Score Equivalents of Raw Scores) suggests a curvilinear relationship between initial score level and extent of improvement on retest and that this relationship varies as a function of age. For example, a child aged 4¼ years whose initial raw-score is at −2 sigma needs to improve his performance by 2 raw score points to maintain this initial relative status when retested: an individual of the same age at 0 sigma needs to increase his score by about 10 raw points to retain his relative position: at +2 sigma, only 4 raw points need be gained on retest to produce an unchanged relative score. At age 6¼ years, the necessary gains in raw score are 11, 13 and 2 points for children at −2, 0, and +2 sigma respectively to retain their relative positions. (All raw scores cited above are approximations).

These admittedly crude observations nevertheless suggest that any assessment of 'learning ability' will have to take into consideration age and initial score level. Other factors, such as motivational conditions, magnitude of retest change, and possibly overall level of ability, would have to be considered, and these in turn related to the 'learning abilities' in reading, arithmetic or any other area of behaviour where facility improves with practice and where retest gains are likely to have predictive validity. It is suggested that detailed empirical foundations need to be established before any attempts are made to interpret retest changes on the Animal House sub-test.

III.—PROPOSED CHANGES IN WORDING.

As with the WISC, certain verbal items are obviously unsuitable for use with British children. It is desirable that any changes in wording be kept to a minimum. Wherever an item is identical to or closely similar to an item in the WISC and changes have been recommended either by the British Psychological Society (1955) or by the Scottish Council (1967), these amendments have been applied. These other changes were made on an *a priori* basis after a few pilot testings (not included in the study reported below) had been tried out.

The changes, test by test, are itemized below :

(1) INFORMATION.
   11. For 'mail' substitute 'post.'
   14. Accepted answers must imply application of heat directly or indirectly by gas, electricity, etc. (Scottish Council).
   15. 'Co-op.' is also an acceptable response (Scottish Council).
   16. For 'nickel' substitute 'shilling.'
       For '5' substitute '12' or 'a dozen.' (Scottish Council).

(3) VOCABULARY.
   8. For 'gasoline' substitute 'petrol.'

(5) ARITHMETIC.
   15. For 'candy' substitute 'chocolate.'
   16. For 'cents' substitute 'pennies.'
   18. For 'cents' substitute 'pennies.'

(8) SIMILARITIES.
   11. For 'sweater' substitute 'pullover' (or 'jersey' or 'jumper,' as appropriate to local usage), making the same alteration throughout the directions on p. 71.
   13. For 'plum-peach' substitute 'apple-orange' (Scottish Council).
       Answer : 'round' is credited with one point.
   14. For 'nickel' substitute 'shilling.'

(10) COMPREHENSION.
   11. For 'sick stay home?' substitute 'ill stay at home?'
   12. For 'grocer' substitute 'shopkeeper' (Scottish Council).

IV.—THE EMPIRICAL STUDY.

(1) *Description of Sample.*

In the Autumn term of 1967, all school entrants (N=440) in the Isle of Wight were tested on a battery of psychological tests as part of a prospective study of learning difficulties. They were also given a developmental neurological examination by a paediatrician as part of a study investigating the efficiency of the first statutory school medical examination. Practical considerations of the time and numbers of testers available limited the number of children who could be tested to a maximum of 150. Therefore approximately one-third of the total Autumn intake could be selected for examination on the WPPSI. Only schools which had sufficient children in them to occupy a psychologist for a full day were selected. Where there were more children than could be tested in the available time, children were tested in random order with the next child on the list being seen in place of any absentee. Thus, although not strictly random, it is difficult to see any systematic bias in the selection of children. In all 76 boys and 74 girls were tested during their second term in infant school.

TABLE 1

SOCIAL CLASS COMPOSITION.

Social Class	Boys	Girls	Total	%	General Population
I and II	21	20	41	27·3	18
III non manual	10	7	17	11·3	11
III manual	29	30	59	39·3	48
IV and V	14	15	29	19·3	22
Unknown	2	2	4	2·7	1
Total	76	74	150	99·9	100

Table 1 shows the social class composition of the sample using the Registrar-General's (1960) Classification of Occupations to group the children according to their father's occupation. For comparison, the data from the 1964 National Sample used in the Plowden Report (Morton-Williams, 1967) are given. It can be seen that the present sample is over-representative of Social Classes I and II by about 9 per cent. and under representative of Social Class III (manual) by a similar amount.

The average age of the children at the time of testing on the WPPSI was 5 years 5 months (S.D.=1.87 months). There was no significant difference in age between boys and girls (see Table 2).

(2) *Administration.*

The tests were administered by the five authors in accordance with the instructions in the manual. However, for the purposes of ascertaining their difficulties (see Yule and Berger, in preparation) all items were presented except in a few cases where to proceed much beyond Wechsler's criterion for discontinuing testing would have jeopardized rapport. Testing was carried out in the schools during normal school hours, and the complete sample was tested within a two-week period. The average testing time was approximately 1¼ hours.

All the testers are experienced in using the WISC, and all had practised the new test on children of the appropriate age prior to the study. Otherwise, there are likely to be no differences between the conditions in this study and those pertaining in routine use of the test. Each tester marked his or her own scripts and apart from checking the arithmetic and conversions prior to analysis of the data, no attempt was made to check on the validity or reliability of the scoring. Thus, the data to be presented below should be strictly comparable (in terms of errors of scoring) with data collected in normal field usage of the test.

(3) *Results.*

The main results are given in Table 2 where the means and standard deviations for each subtest are given for the total group and separately for the two sexes. It will be noticed that all means for the subtests are higher than the expected value of 10. The differences tend to be greater among Performance subtests, and this is reflected in the higher mean Performance Scale IQ of 107·99 compared with the mean Verbal Scale IQ of 103·72. The overall mean Full Scale IQ of 106·33 is clearly above the expected value of 100.

TABLE 2

MEANS AND STANDARD DEVIATIONS OF SUBTESTS.

	Total Sample		76 Boys		74 Girls			
	Mean	S.D.	Mean	S.D.	Mean	S.D.	t	P
Information	10·31	2·98	11·11	3·00	10·50	2·94	1·26	NS
Vocabulary.......	11·11	3·15	11·30	3·21	10·92	3·10	0·75	NS
Arithmetic	10·95	2·66	11·05	3·03	10·85	2·23	0·47	NS
Similarities	10·14	2·40	10·12	2·43	10·16	2·38	0·11	NS
Comprehension ..	10·11	2·51	10·18	2·56	10·04	2·47	0·35	NS
Animal House	11·00	2·63	10·47	2·91	11·54	2·20	2·55	·02>P>·01
Picture Completion	10·35	2·62	10·34	2·50	10·35	2·75	0·02	NS
Mazes	11·17	2·86	11·72	2·63	10·59	2·99	2·48	·02>P>·01
Geometric Design ..	11·96	3·08	12·34	3·36	11·57	2·73	1·56	NS
Block Design	11·39	2·54	11·67	2·58	11·09	2·48	1·40	NS
Verbal Scale IQ ...	103·72	13·58	104·40	14·14	103·03	13·04	0·62	NS
Performance Scale IQ	107·99	13·54	108·93	14·00	107·01	13·08	0·87	NS
Full Scale IQ	106·33	13·49	107·29	14·00	105·34	12·97	0·89	NS
Age in months	65·01	1·87	64·99	1·94	65·03	1·82	0·13	NS

Table 2 also shows that, with two exceptions, there are no significant differences between boys and girls. Girls scored higher on Animal House, whilst boys did better on Mazes. No explanations for these differences spring immediately to mind, and, since the overall Verbal, Performance and Full Scale IQs show no differences, it was felt justifiable to perform remaining analyses on the total sample.

Table 3 shows the inter-correlations between subtests and IQs. It should be noted that the three composite scores are in IQ units and that the correlations between these and individual scale scores have not been corrected for contamination. The values presented, therefore, represent over-estimates of the associations. This should particularly be borne in mind in comparing these results with Wechsler's results shown in the upper triangle of Table 3.

TABLE 3

INTERCORRELATION OF THE TESTS (TOTAL SAMPLE).

Test	Inf.	Voc.	Arith.	Sim.	Comp	An. Hse.	Pic. Comp	Mazes	Geom Des.	Bl. Des.	V IQ	P IQ	FS IQ
Information ..		·56	·57	·40	·59	·38	·41	·42	·42	·42	·82	·54	·75
Vocabulary ..	·60		·55	·34	·56	·33	·40	·33	·38	·35	·78	·47	·69
Arithmetic ...	·56	·53		·34	·49	·40	·39	·43	·50	·54	·77	·60	·75
Similarities ..	·47	·48	·43		·49	·19	·29	·24	·26	·22	·67	·31	·54
Comprehension	·61	·64	·52	·42		·35	·43	·39	·40	·35	·81	·51	·73
Animal House	·30	·33	·38	·40	·27		·45	·42	·49	·46	·43	·74	·65
Picture Completion.....	·40	·45	·44	·35	·41	·47		·49	·43	·38	·50	·72	·68
Mazes	·31	·30	·39	·23	·39	·35	·52		·46	·45	·47	·74	·67
Geometric Design	·32	·22	·36	·27	·34	·14	·23	·42		·63	·51	·80	·73
Block Design .	·39	·48	·55	·43	·41	·48	·57	·61	·41		·49	·77	·70
Verbal Scale IQ	·82	·84	·77	·69	·81	·43	·52	·41	·37	·57		·63	·90
Performance Scale IQ ...	·47	·48	·58	·45	·50	·65	·75	·80	·63	·83	·63		·91
Full Scale IQ	·72	·74	·75	·64	·73	·59	·69	·66	·55	·77	·91	·89	

NOTES:

(1) The last three scores are in IQ units. Correlations between these and individual scale scores have not been corrected for contamination.

(2) Wechsler's data for five-year-olds (Table 13, p. 28) appear above the diagonal, and are reproduced by permission. Copyright (C) 1963, 1967, by The Psychological Corporation, New York, N.Y. 10017. All rights reserved.

Table 4 shows the Verbal-Performance discrepancies found in the total sample. It is immediately apparent that the spread of scores is greater in this sample than in the standardization sample. Whereas Wechsler finds that 15 per cent of his sample have discrepancies in either direction of at least 8 points between their Verbal and Performance IQs, and that only 5 per cent have discrepancies in either direction of at least 10 points, in the present sample approximately 39 per cent have discrepancies greater than 10 points, the majority of these having lower Verbal IQ scores. 56 per cent have discrepancies of at least 8 points.

TABLE 4

VERBAL-PERFORMANCE DISCREPANCIES.

	Positive (V>P)						Negative (V>P)				
	20+	16–20	11–15	6–10	1–5	0	1–5	6–10	11–15	16–20	20+
N	1	8	8	15	20	3	25	28	19	7	16
%	·067	5·33	5·33	10·00	13·33	2·0	16·67	8·67	12·67	4·67	10·67

In the prospective study of learning difficulties, all children had been seen individually during the previous term, within a few weeks of their having started at infant school. Among other things they were tested on four subtests of the Frostig Development Test of Visual Perception (Frostig, *et al.*, 1964), the English Picture Vocabulary Test (Brimer and Dunn, 1962), and the Auditory Decoding Test of the Illinois Test of Psycholinguistic Abilities (Kirk and McCarthy, 1961). The four subtests of the Frostig used were Eye-motor Co-ordination, Figure-ground, Position in Space and Spatial Relationships. The mean and standard deviation of the sum of these four raw scores, together with the same statistics for the raw scores on the EPVT and the ITPA subtest are given in Table 5. There, too, are the correlations with the WPPSI IQs.

TABLE 5

INTERCORRELATION BETWEEN WPPSI AND OTHER MEASURES.

WPPSI	Shortened Frostig	EPVT	ITPA
Verbal Scale IQ	0·48	0·56	0·48
Performance Scale IQ	0·75	0·48	0·38
Full Scale IQ	0·67	0·58	0·48
Mean	16·12	12·30	17·82
SD	4·42	6·06	5·87

Finally, Table 6 shows the social class differences in the mean IQs. One-way analyses of variance were performed, and it can be seen that on all three measures of intelligence, but particularly on the Verbal Scale IQ, there are significant differences across the four social class groups. The difference is largely restricted to the difference between non-manual and manual homes, children from the former scoring, on average, approximately 10 IQ points higher. However, the pattern of lower Verbal than Performance IQ did not differ significantly across the groups.

TABLE 6

SOCIAL CLASS DIFFERENCES : MEAN SCORES.

	I and II	III NM	III Man.	IV and V	F-Ratio	P
Verbal Scale IQ	111·24	109·29	98·47	101·79	9·96	<0·001
Performance Scale IQ	112·44	115·47	104·71	105·79	4·82	<0·01
Full Scale IQ	112·93	113·53	101·56	104·07	8·99	<0·001
Verbal-Performance Differences	—1·00	—6·18	—6·24	—4·00	1·81	N.S.
N	41	17	59	29		

V.—DISCUSSION.

The main finding to be discussed is the higher IQ of the present sample compared with the standardization sample. Various explanations are possible for this finding, although it is unlikely that any one single factor is sufficient to explain the difference of 6 points in favour of the Isle of Wight sample.

The first, and most obvious, factor is that the present sample is over-representative of children of non-manual or 'upper' socio-economic groups and it is widely accepted that children from such backgrounds score more highly on conventional tests of intelligence (Rutter, *et al.*, 1969). Consequently, the largest possible subsample was drawn from children tested so as to be proportionately consistent with the social class composition of the general population. Table 7 shows the numbers selected.

TABLE 7

SOCIAL CLASS COMPOSITION OF REDUCED GROUPS.

Social Class	General Population		Reduced Sample
	%	N	%
I and II	18	22	18·0
III non manual	11	13	10·7
III manual	48	59	48·4
IV and V	22	27	22·1
Unknown	1	1	0·8
	100	122	100·0

Cases were rejected at random within each of the social class groups until the appropriate sub-total was reached. The data on this reduced representative group were then analysed as before, and the results are presented in Table 8.

TABLE 8

MEANS AND STANDARD DEVIATIONS OF SUBTESTS FOR REPRESENTATIVE SAMPLE.

Subtest	Mean	S.D.
Information	10·70	3·04
Vocabulary	10·84	3·09
Arithmetic	10·70	2·54
Similarities	9·98	2·43
Comprehension	9·94	2·42
Animal House	10·92	2·65
Picture Completion	10·25	2·68
Mazes	10·93	2·79
Geometric Design	11·80	3·10
Block Design	11·20	2·46
Verbal Scale IQ	102·49	13·54
Performance Scale IQ	106·98	13·16
Full Scale IQ	105·07	13·22

As expected, the exercise resulted in an overall lowering of the means which can be regarded as possibly more representative of the average performance of children in England and Wales as a whole. The mean Full Scale IQ is now found to be 105·07, still substantially above the American norms. Thus, the social class composition is only a partial explanation of the higher value obtained.

Secondly, children in the present sample had all been attending infant schools for one full term prior to testing. Current educational practice in much of the United States is not to start formal schooling in the majority of States before the children are 6 years old. It is therefore likely that the effects of a term's schooling would be reflected in possibly greater co-operation in the testing situation, greater familiarity with materials used in testing (especially pencils as used in the Geometric Design subtest), and consequently better performance on the test. Further, the possible influence of ' test sophistication ' cannot be excluded.

Thirdly, the American sample contained 14 per cent non-white children. Recent research clearly shows that in the current social structure in the United States, non-white children are ' disadvantaged ' and perform less well on verbally loaded intelligence tests (Carson and Rabin, 1960; Semler and Iscoe, 1966). Thus, the standardization mean would be somewhat depressed.

Finally, formal changes in item wording and any extension of the range of acceptable responses necessitated by cultural differences in language usage, are likely to affect item difficulties.

Whatever the final explanation of this phenomenon, the present results are consistent with previous findings which show that British children score more highly on this sort of intelligence test (Scottish Council for Educational Research, 1967; Jones, 1962; Rutter, *et al.*, 1969). On balance, it would seem that one can conclude that British 5-year-olds score more highly on the WPPSI than their American peers. For practical purposes, the best estimate of mean Full Scale IQ (corrected for social class bias) is 105·07 (SD=13·22), and percentile placements should be adjusted accordingly.

As regards the intercorrelations among subtests, with the possible exception of correlations involving Geometric Design, the values obtained correspond closely to Wechsler's shown above the diagonal in Table 3. The values for Geometric Design are almost all considerably lower. Since this was the test which departed most from the American mean, and since its scoring involves a great deal of judgment, it is possible that the scoring is highly unreliable and that the marks have been too lenient. At present, we are rescoring this and all the other subtests which lend themselves to the procedure to get estimates of inter-rater reliability—estimates not given in Wechsler's manual. This study will be reported separately (Yule and Berger, in preparation).

More lenient and/or less reliable scoring of the Performance subtests could also be a partial explanation for the striking finding regarding the greater proportion of Verbal-Performance discrepancies greater than 8 points. As was seen in Table 4, large discrepancies in both directions were found, but discrepancies showing a comparative Verbal deficit predominated. This finding runs counter to any suggestion that the disproportionate number of children from non-manual homes could explain the difference, since one might have expected them to have more cases of lower Performance IQ. In fact, as was seen in Table 6, there were no significant differences across the groups, although there was a slight tendency for children in Social Classes I and II to have smaller discrepancies.

This finding, then, argues for a close examination of the scoring criteria on Performance subtests. If these are found to be adequate and reliable, it is possible that restandardization of the tests is called for.

The limited data shown in Table 5 only reflect the concurrent validity of the test indirectly. In particular, the English Picture Vocabulary Test was administered to these children during their first term at school when their average age was 4 years 11·9 months (SD=2·26 months), and almost half were below the age of 5 years, the basal age for this test. Even so, the correlation of 0·58 between the WPPSI Full Scale IQ and the EPVT raw score of three months previously, is identical with the value reported by Wechsler. The higher correlation between the Frostig test and the Performance Scale (0·75) than the Verbal Scale (0·48) reflects on the validity of both tests, and calls into question the use of the Frostig as a test of Perceptual Development without first partialling out the effects of general intelligence.

The social class differences shown in Table 6 are very striking indeed, amounting, as they do, to nearly two-thirds of a standard deviation between non-manual and manual classes. In interpreting this, it must be remembered that these children are only 5 years 5 months old (on average), and have been in school for just over one term. A retest of these children in this sample in the future would show whether schooling does anything to close this gap.

VI.—GENERAL COMMENTS.

In general, we were favourably impressed with this test. The WPPSI manual is convenient to use, since both instructions and answer criteria are contained together. The children enjoyed doing the test, and the mixture of Verbal and Performance items seemed to maintain their interest. Fatigue was not often encountered, which some may think surprising since the test took just over one hour to administer.

Possible doubts over the reliability of scoring have already been expressed and these are being investigated. However, it may be of interest to record certain commonly occurring responses which other users of the test in Great Britain may encounter, and which do not appear in the manual.

Information.

14. The answer " Put it on " was frequently given. It was difficult to elicit from the child whether or not he was referring to an electric kettle (in which case this appears to satisfy the Scottish Council's revised criteria) whilst asking only the permitted probes.

16. This turned out to be much more difficult than expected, partly, no doubt, as a direct result of a policy decision not to teach the current money system to these children who will shortly be faced with the change-over to the decimal system. (When that comes, the answers will, of course, have to be changed.)

23. " In the sky " should not be accepted as an answer. (Yule and Berger, in preparation.)

Animal House.

The only minor criticism to be made of the administration of this subtest is that there are insufficient pegs of each colour should a child perseverate on one or two colours.

Vocabulary.

As with the WISC, these words seem almost deliberately chosen to have many near-homonyms. Among those which we picked up were 1, 13, 14, 15, 16, 17 and 22. One can only hope that in future revisions, such words are avoided, and in the meantime watch one's diction.

Item 12 produced a variety of answers not associated with the examples given. Card game, ' photograph,' and ' breaks ' were the commonest, and all were credited. In the Midlands, ' biscuit ' will also have to be credited in full.

Mazes.

Both testers and children found the instructions rather lengthy. Easier ' flow ' came with practice. The interruption of the child as soon as he makes a mistake on item 2 or on the second mistake in item 3 is bad for continuity and the child's morale. We would recommend that the child be allowed to finish the maze regardless of the errors made.

Geometric Design.

The use of the ' special,' copyrighted, blank paper seems unnecessarily commercial. Ordinary quarto paper folded in two serves equally well. Surely psychologists can be trusted to write the appropriate number on each drawing and to indicate top and bottom relative to the child rather than circle the number. In these days of economic adversity, such a saving could be considerable and help keep down the balance of payments deficit !

VII.—CONCLUSIONS.

This is a comparatively well standardized test, interesting to the children and it promises to yield useful diagnostic information. In using it, testers should be careful to score performance items strictly. In interpreting results with British children, it should be remembered that the expected mean is about 105 on the Full Scale IQ. Great care should be taken in interpreting Verbal-Performance discrepancies, which appear to be larger among British children. There is a large social class differential between children of non-manual and manual parents.

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THE WPPSI: A MIDLANDS STUDY

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SUMMARY. The Wechsler Preschool and Primary Scale of Intelligence, modified in certain respects in order to render it suitable for use with a British child population, was administered to a random sample (n=60) of 5½-year-old children in Nottingham. Results are compared with those obtained by Yule *et al* (1969) and it is noted that except for means and standard deviations they are closely similar. Though the studies agree as to the absence of significant sex differences it is suggested in this paper that there may well be a bias in favour of boys throughout the Scale.

I.—INTRODUCTION.

THE background to, and the format of, the new Wechsler Scale is discussed thoroughly in the preceding paper, Yule *et al.* (1969), and will not be further elaborated here.

This study was undertaken in light of the fact that previous Wechsler Scales had been found by a number of authors (Jones, 1962; Scottish Council for Research in Education, 1967; Brittain, 1968) to need alteration and re-standardization prior to use in this country and it was desired to check whether or not this would also apply to WPPSI.

The 5½-year-old age group was chosen because it is within the overlap between WPPSI and WISC, and it is hoped to make a comparison between these Scales at a later date.

II.—METHOD.

The WPPSI was administered by the present author to a random sample of 5½-year-old Nottingham children, after it had been tried out with a number of 5 to 6-year-old children not included in this study. All children were tested in their own schools, and all appeared to enjoy the test sessions. Testing took 75 minutes on average, varying by not more than 15 minutes either way. The instructions in the Manual were adhered to, except insofar as testing continued far past the ceiling limits imposed by Wechsler—in order to investigate item difficulty adequately—and the alterations shown below were made to the verbal content of the items indicated in order to rid the test of American idiom. The published item numbers and the item numbers found to be appropriate for the same items after consideration of item difficulties found empirically in this study are also shown. Comparison of the item numbers suggests that all alterations are appropriate and technically satisfactory.

Test	*Old Item Number*	*New Item Number*	*Alteration*
INFORMATION	3	2	Delete 'finger.'*
	11	8	For 'mail' read 'post.'
	15	16	For 'store' read 'shop.'*
	16	18	For 'nickel' read 'shilling.'*
	16A	18A	For '5' read '12.'*
VOCABULARY	8	8	For 'Gasoline' read 'Petrol.'
	12A	13A	Accept 'card game.'
ARITHMETIC	15	15	For 'pieces of candy' and 'piece' read 'sweets' and 'sweet' respectively.
	16 and 18	16 and 18	For 'cents' read 'pence.'

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† Now with the School Psychological Service, City of Coventry.

SIMILARITIES	11	13	For ' sweater ' read ' jumper.'
	13	11	For ' peach ' read ' cherry.'*
	14	10	For ' nickel ' read ' shilling.'*
COMPREHENSION	11	9	For ' sick ' read ' poorly.'

* Amendments to WISC recommended by the British Psychological Society (1955).

It will be observed that there are some discrepancies between the amendments made by Yule *et al* and those made in this study. For the most part these differences are so slight that there will be no difficulty in reconciling them. In the case of Arithmetic item 15 it is suggested that ' sweets ' is a more appropriate substitute for ' candy ' than is ' chocolate .' In the case of Similarities item 13 it is now regretted that the change was not made from ' plum-peach ' to ' apple-orange ' instead of ' plum-cherry ' as was done by Yule *et al* and SCRE. In the case of Vocabulary item 12 this author disagrees flatly that ' biscuit ' should be credited in full—or at all—in the Midlands.

All children in the City of Nottingham, born on the 10th or 20th days of any of the last six months of 1962 were listed alphabetically, giving a sample frame of 178 children (86B 92G). From this list were removed the names of children who could not be traced in the schools (18B 13G), who were known to have left the district (1B 3G), who had not yet been admitted to school (1G), who were immigrants (6B 11G) or who were too severely handicapped physically to cope with the Performance Scale tests (2G). This gave a final sampling frame of 123 children (61B 62G) from which 60 children (30B 30G) were chosen at random for testing. The randomness of selection from both the original and final sampling frames was checked by means of the One-Sample Runs Test (Siegel, 1956) and the values of z obtained, 1·26 and ·07 respectively, indicate that the tested sample may be confidently accepted as a random sample of the 5½-year-old population.

III.—RESULTS.

(1) *Means and Standard Deviations.*

Results obtained from testing, in terms of means and standard deviations, are presented in Table 1. For the main scales they are given in IQ units and

TABLE 1

MEANS AND STANDARD DEVIATIONS OF SUB-TESTS.

Test	Total Sample		Boys (n=30)		Girls (n=30)		t	p
	M	s.d.	M	s.d.	M	s.d.		
Information	9·6	3·4	10·5	3·8	8·7	2·8	1·18	NS
Vocabulary	10·4	3·5	11·4	3·3	9·5	3·5	2·16	·05
Arithmetic	11·2	3·4	11·7	3·5	10·6	3·2	1·26	NS
Similarities	10·1	2·2	10·2	2·4	10·0	2·1	0·40	NS
Comprehension	9·1	2·6	9·5	2·5	8·7	2·7	1·24	NS
Animal House	9·4	2·6	9·4	2·6	9·3	2·7	0·10	NS
Picture Completion	9·2	2·7	9·3	2·9	9·1	2·6	0·24	NS
Mazes	10·2	3·4	11·0	3·1	9·4	3·5	1·92	NS
Geometric Design	10·2	3·4	11·0	3·5	9·4	3·5	1·78	NS
Block Design	10·4	3·0	11·0	3·1	9·8	2·8	1·64	NS
Verbal Scale	100·5	15·9	104·3	16·4	96·6	14·5	1·93	NS
Performance Scale	100·6	16·9	102·5	17·7	98·7	16·2	0·85	NS
Full Scale	100·7	16·8	103·8	17·4	97·5	15·7	1·48	NS

for the tests in scaled score units. The values obtained for the total sample do not differ significantly from the expected values of m=100, s=15 for the main scales, and m=10, s=3 for the tests.

These results differ markedly from those obtained by Yule *et al* but no explanation can be offered at this point. It will be interesting to see what results are obtained in further, preferably still larger scale, studies.

(2) *Sex Differences.*

Yule *et al*'s finding that there are no significant differences between sexes is largely confirmed in this study, though there is an exception in the case of the Vocabulary test. The difference here is significant only at the ·05 level, and as the only result in ten to reach this level may still conceivably be a chance result. On the other hand it conforms with the results of a number of studies—e.g., Hobson, 1947; Dunsdon and Fraser-Roberts, 1957; Templin, 1957; and Miele, 1958—which show that in tests of verbal *meaning*—as opposed to word fluency, articulation, sentence completion and other forms of verbal facility—boys' results are generally superior to those of girls.

Perhaps more important is the fact that in all ten test results the direction of the differences in mean scores is in favour of boys. The probability of all results taking this direction by chance is less than ·002. Whether this result is indicative of a general bias in favour of boys throughout the Scale or is merely an artefact of this study must await resolution by other, larger scale, studies.

(3) *Verbal—Performance Discrepancies.*

Discrepancies between Verbal and Performance Scale scores obtained in this study ranged, in absolute values, from 0 to 29. For the 5½-year-old population Wechsler gives a discrepancy of 7·01 IQ points as significant at the 15 per cent level and a discrepancy of 9·55 IQ points as significant at the 5 per cent level. The comparative figures for the present sample were 8·97 and 12·21 IQ points respectively. 57 per cent of discrepancies were greater than 8 points and 40 per cent were greater than 10 points. Thirty-one children (18B 13G) had higher Verbal scores and 26 (11B 15G) had higher Performance scores, while only three had equal scores. The figures for discrepancies greater than 8 and 10 IQ points respectively are almost precisely the same as those found by Yule *et al.*

(4) *Reliability.*

Values for the reliability of the main scales and individual tests as estimated by the split-half (odd-even) correlation coefficient corrected by the Spearman-Brown formula, together with the standard error of measurement for each test, are presented in comparative form in Table 2.

The coefficients are of a high order and suggest that WPPSI is adequately reliable for use as an individual test in a clinical situation.

(5) *Item Difficulty.*

Levels of item difficulty, as found empirically in this study, were calculated for all items in each test except Animal House. Each item was then allocated a new number on the basis of its place within the scale of item difficulty for the appropriate test, and the new numbers were compared with the published item numbers. In each test a number of differences were found but all these differences would be catered for by the number of consecutive failures allowed before stopping testing, except in the case of the Vocabulary test where word number 20 moves down eight places to become number 12 in order of difficulty.

TABLE 2

Reliability Coefficients.

Test	Wechsler (1967)		This Study	
	r_{xx}	S.E.m	r_{xx}	S.E.m
Information	·81	1·31	·90	1·74
Vocabulary	·85	1·18	·86	1·71
Arithmetic	·86	1·06	·81	0·88
Similarities	·82	1·32	·73	1·22
Comprehension	·84	1·19	·82	1·28
Animal House	—	—	—	—
Picture Completion	·86	1·12	·86	2·23
Mazes	·91	0·87	·89	1·12
Geometric Design	·84	1·25	·90	1·00
Block Design	·85	1·17	·88	0·89
Verbal Scale	·95	3·40	·93	1·83
Performance Scale	·95	3·49	·96	1·32
Full Scale	·97	2·68	·97	2·76

There is no readily apparent reason why this word should be easier for British children than for American children. The new level of difficulty for this word is the same for boys and girls.

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ANXIETY ABOUT SCHOOL AMONG FIRST-YEAR GRAMMAR SCHOOL PUPILS, AND ITS RELATION TO OCCUPATIONAL CLASS AND CO-EDUCATION

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SUMMARY. A revised Boxall School Anxiety Test was administered to 1,120 first-year grammar school pupils in 42 schools in South Wales and the West Riding. After separating these into pupils from mixed, boys' and girls' schools, scores were seen to be consistently related to occupational class, the most anxious pupils being from the lower classes. Girls recorded a greater anxiety than boys. Pupils in single-sex schools had slightly higher scores than those in mixed schools, but both groups had only recently entered these schools.

I.—INTRODUCTION.

THIS study examined the hypothesis that pupil anxiety about school would be less in co-educational than in single-sex grammar schools. There is little direct evidence about this. Lotz (1952) in New York administered the Mooney Problem Check List to freshmen and seniors of a mixed, a girls' and a boys' high school, roughly matched for background. Selecting five areas of problems, none specifically about school itself, he found that in areas such as Social, Emotional and ' Courtship and Sex,' the difference between junior and senior girls was significantly more favourable to the mixed than to the girls' school, whereas in the case of boys the slighter difference in favour of the mixed school was not statistically significant. Other tests confirmed this trend, but unfortunately Lotz used only three schools, and in view of the decided variability within types of school it would be dangerous to generalise. One also wonders whether the rather better adjustment of the junior co-educated girls *vis à vis* those from the girls' school, might not in itself have been the cause of an increased difference between the two groups at a later age, even if both had attended the same type of school.

Furneaux (1961) reported that boys in co-educational schools displayed excessive nervousness and similar temperamental difficulties much more frequently than other boys, but this finding needs to be treated with caution as no account was taken of the social class variable which is shown in this paper to be important (Fitt, 1956; Coster, 1958; Hallworth, 1961), and we know that there is in this country an imbalance of the social classes between co-educational and single-sex grammar schools (Sutherland, 1961). The trend is to be found in this study, even though an attempt was made to select schools matched, by administrative judgment, for background.

Other findings related to the problem are that girls tend to score more highly on anxiety than boys (Boxall, 1961, for anxiety to school; Sarason, 1960; Grams, 1965; Lynn, 1959): that high anxiety scores have a significant negative relationship with IQ (McCandless, 1956a and b; Sarason, 1960; Cowen, 1965), and that secondary modern children have higher scores than grammar school children on ' general manifest anxiety ' and ' separation anxiety' measured by questionnaires (Hallworth, 1964). This last effect may of course be associated with social class rather than with the type of school, and may also be affected by the academic ability variable. Most of this work has been on general anxiety and test anxiety, and it has been demonstrated that the two are highly correlated (Sarason, 1960, pp.130-131). One would also expect an appreciable positive correlation between these and anxiety towards school.

II.—PROCEDURE.

This article describes a small portion of a project investigating aspects of the social and emotional adjustment of secondary grammar pupils. It is a longitudinal study, but this paper presents only the results concerned with anxiety towards school from the first (1964) testing.

Anxiety towards school was measured by a paper-and-pencil test initially devised by Boxall (1961) and now extensively modified by the writer (see Appendix). The items were based on the experience of its compiler as a teacher; the original test when correlated against the Castaneda test gave product-moment coefficients ranging fron 0·66 (boys) to 0·83 (girls), and against the Sarason Test from 0·49 to 0·77, while for comparison the corresponding figures for the Castaneda against the Sarason were 0·5 to 0·66 (Boxall, 1961). Boxall later subjected the items to discrimination by the upper and lower third technique, and the writer based the present test of 23 items primarily upon the elimination of those found to be low in discriminatory power. One question was dropped because of ambiguity and a second on the consensus of three psychologists scrutinising all questions independently. The resulting test, though not as refined as we would have liked (through lack of time), has yielded interesting and consistent results. Its corrected split-half reliability co-efficient was ·802 (girls) and ·699 (boys). Both groups had an age range of only one year. When the girls' scores were correlated with the Mooney Problem Check List (English version), which relates to general anxiety rather than to school alone, the coefficient was 0·42.

The test was administered to the boys' groups by the writer and to the girls' groups by a female research assistant, thus ensuring close similarity of procedure within each sex. The pupils were assured the work was confidential, were requested not to give their names, and the importance of the project was stressed. They worked independently under examination conditions, and their attitude was excellent.

As it was hypothesized that social class factors would affect the results, each pupil was asked the precise occupation of his or her father. The occupational groupings are based upon the Registrar-General's classification, and comprise the five categories used in the report on *Early Leaving* (1954, p. 97): (1) professional and managerial; (2) clerical; (3) skilled; (4) semi-skilled; and (5) unskilled.

As another variable was expected to be whether the school was single-sex or co-educational, the experimental design included equal numbers of boys', girls' and co-educational schools. An attempt was made to control a further variable—the influence of an individual head and his staff as a unit within each group of schools—by taking a sufficiently large number of schools. Financial considerations limited the number to 14 of each type (girls', boys' and mixed, matched for background) with the result that this school variable was diminished in influence rather than controlled. Twenty pupils were tested in single-sex schools and twenty of each sex in co-educational schools; in a four-stream school these twenties would be the first five pupils on the register of each class.

Anxiety towards school has been measured by the number of situations in which the pupil admits to feeling anxious, rather than by weighting each item for severity. Each affirmative reply scored one point, the 'No' replies scoring nought.

The larger project, of which the Boxall Anxiety Test was a part, included teachers' ratings of the pupils on the Bristol Social Adjustment Guide, and reference to the results is made in this paper.

III.—RESULTS.

Social class.

The results in Table 1 show a small but interesting increase in the pupils' school anxiety score as one goes down the occupational scale. We find the same slight progression in all four major groups: Boys in boys' schools, boys in mixed schools, girls in girls' schools and girls in mixed schools. In each group there were 14 schools and 280 pupils aged 11 plus. (Numbers in Table 1 are slightly less than 280 because a few pupils accidentally omitted to complete this test, which was one of a battery). Only here and there do the differences reach statistical significance,* but the fact that nine of them are in the indicated direction and only three against lends additional support to the argument (application of the Wilcoxon Sign-Rank Test producing a confidence level of ·05).

TABLE 1

MEAN ANXIETY SCORE BY SCHOOL AND SOCIAL CLASS.

	Pupils	Class 1		Class 2		Class 3		Classes 4 and 5		All† Classes
		N		N		N		N		
Girls in girls' schools	275	43	11·63	73	12·20	120	12·86	35	14·40	12·63
Girls in mixed schools	275	42	10·81	70	11·88	116	13·01	45	12·22	12·27
Boys in boys' schools	278	30	11·23	98	10·98	117	12·45	29	12·79	11·83
Boys in mixed schools	275	33	10·45	66	10·74	136	11·87	38	11·26	11·38
All schools	1,103	148	11·05	307	11·43	489	12·52	147	12·60	12·03

† Includes a few unclassifiable pupils.

There are several breaks in the anxiety score progression which need comment. The one between Class 1 and Class 2 for boys' schools is small and may be due to chance fluctuation. That between Class 3 and Classes 4/5 for both boys and girls in mixed schools may be more important, because its occurrence with both sexes increases the likelihood that for some reason children of occupational classes 4/5 were less anxious in the mixed than in the single-sex schools.

A possible explanation would have been the existence in the mixed school sample of one or two particularly harmoniously run schools which had a fairly large percentage of children of manual workers; this chance 'authority' variable might then have countered the normal influence of social class. A detailed analysis, however, showed that the effect was spread fairly widely, as the girls of classes 4/5 had lower means than the rest of the school sample in 6 out of 12 co-educational schools, and the boys in 7 out of 12. (In two schools there were no Class 4 and 5 pupils.) This tendency was not to be seen in teachers' ratings on the Bristol Social Adjustment Guide, but the care with which these were done varied from scrupulously conscientious to a reluctant participation, and the weight of their evidence is thereby reduced, though it can by no means be dismissed. Similarly the Guide's part-scores for Anxiety to Children and Anxiety to Adults, which might be thought to be more nearly related to Anxiety to school than are the total scores, failed to show this reduction in score for social classes 4/5 in three out of four possible cases and the fourth case (boys on Anxiety to Adults) was not statistically significant.

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* Differences significant at the 5 per cent level are those between Classes 2 and 3 in boys' schools, Classes 1 and 4-5 in girls' schools and Classes 1 and 3 for girls in mixed schools. Several of the other differences fall a little short of this level. Standard deviations for the four groups in the same order are: 4·683, 4·609, 4·553, 4·718.

The largest and most consistent difference in anxiety score associated with occupational class is none the less that between the non-manual and manual workers. However, as the tests were given very early in the school year, in a period ranging from a few days to two months after the start, one cannot say whether the differences are due to the atmosphere of the schools or were present on entry. The number of pupils was sufficiently large to bring the variation due to individual differences under reasonable control.

Sex differences.

Contrasting girls with boys we see that in both single-sex and mixed schools, for all social classes, the girls record a higher average score, the consistency of the pattern being quite remarkable and statistically significant for the overall averages though not for separate occupational classes. In this sample, also, the range of mean anxiety scores between these classes is greater for girls in girls' schools than for boys in boys' schools, and for girls in mixed schools (t=1·506), compared with boys in the same schools (t=0·882); the difference between the extreme classes is statistically significant within the girls' schools (t=2·789) and not within the boys' (t=1·378).

Co-education.

When we compare the 'admitted anxiety' to school in single-sex and mixed schools, we find that with each sex the mixed schools have a lower score, the direction of difference being consistent through all social classes with the single exception of girls in Class 3 (applying the Sign Test to the set of 8 differences, p=·035 for a one-tail test); and this exception may well be caused by chance circumstances such as an unusual distribution of scores due to the individual difference variable rather than to the type of school variable. Comparing the two boys' groups, taking each social class separately, none of the differences is statistically significant, the highest 't' being 1·530 for social classes 4/5, and that for all classes combined being 1·127. For the two groups of girls the difference in the social class 4/5 section is statistically significant (t=2·663), but that for all classes combined is not (t=0·916).

Arithmetic.

The four questions concerned with anxiety about arithmetic (Questions 2, 3, 8 and 19: see Appendix) produced results which were rather different from those expected. For example, the scores of girls in girls' schools and those in mixed schools were almost identical in total, nor did the girls' separate occupational class scores differ markedly within each type of school, though in the comparison of schools the single-sex had a slight advantage in Class 4/5 and a slighter one in Class 3, while the girls in mixed schools had similar advantages in Class 1 and Class 2. One wonders here whether the present employment of men to teach mathematics in girls' schools is having any effect on the scores, and this topic is being investigated. With the boys' groups equality was expected, but surprisingly enough there was a highly significant difference in favour of the boys in mixed schools (see Table 2).

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TABLE 2

RESPONSES TO QUESTIONS ON ANXIETY ABOUT ARITHMETIC.

	Anxious	Not anxious
Girls in girls' schools	610	500
Girls in mixed schools	603	510
Boys in boys' schools	597	518
Boys in mixed schools	535	579

The pupils of every occupational class contributed to this difference. In the mixed schools the boys showed a clear increase of anxiety as occupational class became lower (Chi-square between extreme classes significant at ·025 level), and their counterparts in the boys' schools showed a slighter and irregular tendency in the same direction. It is interesting that girls in girls' schools recorded almost the same amount of anxiety as boys in boys' schools, but the girls in mixed schools recorded a significantly higher level than the boys in mixed schools (Chi-square=8·55), though they were about the same level as girls in girls' schools.

School (sub analysis).

Another four questions (4, 5, 20 and 21) had been pre-selected as the more important ones reflecting anxiety about school in general, distinguishing these from items indicating anxiety about particular subjects, examinations and class-work (see Table 3).

TABLE 3

RESPONSES TO QUESTIONS ON ANXIETY ABOUT SCHOOL IN GENERAL.

	Anxious	Not anxious
Girls in girls' schools	424	676
Girls in mixed schools	379	721
Boys in boys' schools	442	667
Boys in mixed schools	405	691

The difference between the girls was statistically significant (Chi-square= 3·971) with the girls from mixed schools having the lower anxiety score, but that between boys (Chi-square=1·964) fell short of the ·05 level.

IV.—DISCUSSION.

The technique of self-report is of little value if the subject is strongly motivated to falsify the image of himself which he reveals in his answer. The administration procedure endeavoured to remove this fear, and both observation and analysis of the written replies to other tests indicate a high degree of success in this direction. In addition the study was not primarily interested in either individual scores or the 'absolute level' of anxiety towards school, but investigated differences between large groups, and it was presumed that there would be a reasonable similarity in the 'honesty levels' of these groups.

However, partly because this similarity has not been proved and partly on other theoretical grounds, the scores are regarded as relating to 'admitted anxiety.' The same argument applies to the effect of 'Social Desirability' on the scores; both the anonymity and the stressed national importance of the work removed much of the testees' motivation to give merely socially acceptable answers. Mukherjee's (1966) finding that the 'Social Desirability' factor affected the validity of his testee's anxiety scores was produced, in the writer's opinion, by his method of test administration. His testees either held official positions or were 'graduate assistants' in universities, and might well have been suspicious of the purpose of the test; moreover asking them to sit the test in their own time probably increased the 'social desirability' contamination.

The finding that admitted anxiety to school, as measured by self-report, is related to the occupational class of the parents of grammar school pupils can be interpreted either as giving a true picture, or as indicating that these pupils from the lower classes are more ready to admit to anxiety. Partly in order to assess this latter possibility teachers were asked to complete a Bristol Adjustment Guide for each pupil; the mean scores derived from these, though measuring a wider area of adjustment than the Boxall, showed the same relationship to social class as did the paper-and-pencil test (applying the Sign Test, for 12 differences in the expected direction out of 16, $p = \cdot 038$ for a one-tail test.) Even this partial substantiation must be qualified, as the teachers being middle class themselves might have a tendency to be more in harmony with middle class pupils, though the objective nature of the Bristol items would lessen this danger. On theoretical grounds also one would expect the school anxiety level to be greater among the lower social classes, first because the milieu they have just entered is stranger to them than to the middle class pupils, secondly because they tend to make less academic progress and should therefore become more anxious, as an increase in the difficulty of the task appears to increase anxiety. The situation is far from simple, however, and in extreme cases a pupil might realise that the task was too hard, give it up and cease to be anxious about it.

It might be thought that the work of Bene on anxiety (1964) is sufficiently similar to the present study that the findings should be in line, or at least not opposed. She reported a higher level of *adaptive socialised anxiety* among middle class grammar school boys than among working class boys from secondary modern schools, agreeing with Davis's theory, whereas here the finding is that the pupils from the lower social classes of 42 grammar schools scored more highly than the pupils from the upper classes on a *test of anxiety about school.* A number of points need to be made in reply. First, Bene like Davis, was concerned with anxiety about achievement whereas this study was about anxiety in school in general. Second, when Bene held type of school (and level of intelligence) constant, the difference between the social classes, though in the same direction, became much smaller in the grammar school and vanished in the secondary modern; this tendency should be related to the fact that the present study was confined to grammar schools. Third, failure in the 11 plus examination might have made the secondary modern pupils resigned to academic inferiority and therefore less anxious about achievement, especially as at that date they had no particular goal to aim at. Fourth, Bene's Sentence Completion Test is not only partly subjective in marking (in spite of her ingenious and valuable marking system), but the greater literacy of the grammar school pupils would naturally lead them to compose longer and more complex sentences which might in turn have unexpected effects on the comparative anxiety scores;

for example a working class pupil might complete the phrase ' I hate ' with ' my father,' while the middle class one might also add ' my father,' but continue with ' my brother, school and washing up ' ; the first pupil has recorded a hate in one area and the second a hate in three areas, not necessarily because the first has fewer hates. In addition Bene's method of scoring (by calculating for example, the percentage of testees anxious about school and percentage anxious about parents) makes each of the areas of anxiety compete, as it were, for statements, and as her working class pupils in the secondary modern schools are much more anxious about parents, home and siblings than are her middle class pupils in the grammar schools, this leads automatically to a reduction in the percentage recording anxiety about achievement in school. If, however, a test were administered on anxiety about achievement alone, the score of those working class pupils might rise appreciably in relation to that of the middle class. It would, therefore, be theoretically possible both for Bene's ***percentage*** scores for socialised adaptive anxiety to be higher for grammar than for secondary modern pupils and the ' ***absolute*** ' scores of Hallworth (and this study in anxiety to school) to reverse this difference.

The main findings of the present study are fully supported by the large-scale and thorough investigation by Hallworth (1964) and that of Fitt (1956). All three studies used a questionnaire type of approach. Coster (1958) also concluded that pupils of higher social class had a better attitude to school, and one would expect this to lead to reduced anxiety. In all the discussion on social class, however, it should be kept in mind that in grammar schools lower class pupils are a much smaller proportion of their population age group than are the higher class pupils, and though the admission of greater numbers of lower class pupils might reasonably be expected to increase the average anxiety to school of lower class pupils, because of their lower academic ability, this has not been proved in this study.

In the comparison of the scores of pupils from mixed and single-sex schools it should be emphasized that the pupils had only recently started school, and we cannot know definitely whether the differences found are caused by the pupils' first impressions of school or by an inherent difference in the pupil intake. It seems probable, however, that it is the former, because in accordance with the principal finding of this study and those of Hallworth (1964), one would have expected the rather higher social class intake of the single-sex schools to have had a lower anxiety score than that of the mixed schools. As the entry to the single-sex schools was also found to be slightly more intelligent one would again have expected their school anxiety scores to be slightly lower than those of corresponding sexes in the mixed schools. The difference found (in the opposite direction) may have been produced by the difference between the ' family atmosphere ' of the mixed school and the perhaps slightly more institutional one of the single-sex schools, but it is small and this study merely brings it to the attention of research workers to await further exploration. A longitudinal study of the same schools, now in progress, will provide more evidence.

Throughout Table 1, in eight pairs of comparisons, girls score more highly than boys, and by the Sign Test this would be highly significant. What we do not know is whether this higher scoring is a true reflection of comparative anxiety or whether the social milieu of the boy, in which it is ' not done ' to admit to fear, has its influence consciously or unconsciously in his answers to the questions. As this comparison was not the principal theme of the study, no further work was done on it. The greater range of the girls' scores, between social class 1 and social classes 4/5, when compared with the boys', leads to the speculation that the girls might have a rather more snobbish, class-conscious attitude than the boys, leading to a higher level of anxiety to school among girls from the lower social classes, but this is left to the exploration of others.

The finding that the boys in boys' schools showed more anxiety about their arithmetic lessons, in comparison with the boys in mixed schools, is in line with findings about the rather higher standard of attainment in this subject among boys in mixed maintained grammar schools (Dale 1962), though one would have expected the same anxiety trend in the girls as well. It would, however, be dangerous to generalize this finding until further work has been done, first because of the rather small numbers of teachers involved—estimated at about 28 in each group—with the possibility that they might not have been sufficiently representative, second because of the very short time the pupils had spent in the school.

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VI.—Appendix.

Modified Boxall Anxiety Test.

Here is a list of statements. *Underline* either 'Yes' or 'No' for each one according to whether or not it is true for you. Answer *all* the questions.

All About School

1. I feel all funny inside if I have to stand up and speak in front of the class. Yes/No
2. I get very worried if I see a new kind of sum on the blackboard and I do not know how to do it. Yes/No
3. It worries me if some of my sums are wrong. Yes/No
4. My teacher makes me frightened when he or she is cross with the class. Yes/No
5. At home I often worry about school. Yes/No
6. I am very worried if I promise to bring to school a book and then forget. Yes/No
7. I dread making a mistake when reading aloud to the class. Yes/No
8. I don't like other children to know if I get a bad mark for arithmetic. Yes/No
9. I do not like having new teachers. Yes/No
10. Shivers go up and down my spine if I hear that a child in school is to be severely punished. Yes/No
11. I feel so awful if I haven't got gym shoes for P.T. lessons. Yes/No
12. I go all hot and cold inside if I think that I am late for school. Yes/No
13. I dread the thought of my parents coming and talking to my teacher. Yes/No
14. I should hate to go into a new class with strange children. Yes/No
15. I am miserable if my teacher grumbles at me. Yes/No
16. I dread the thought of examinations. Yes/No
17. I hate it if my teacher looks over my shoulder while I am writing. Yes/No
18. I dread having to see the school doctor. Yes/No
19. I get all dithery and muddled if my Mathematics teacher asks sudden questions. Yes/No
20. I hate having to go back to school when I have been away. Yes/No
21. I think that coming back to school after the holidays is frightening. Yes/No
22. I am sure that I would go white if I got a message that I am to go to see the Headmaster/Headmistress. Yes/No
23. Sometimes I have horrid dreams about school. Yes/No

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SELF IMAGES AND SMOKING BEHAVIOUR AMONG SCHOOL BOYS

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SUMMARY. Four semantic differential questionnaires were employed to investigate the ways in which boys aged 11–15 perceive smoking. Each questionnaire consisted of 19 bi-polar scales against which the boys had to rate the following four concepts : ' the boy smoker ' ; ' the boy non-smoker ' ; ' the self ' ; and ' the ideal self.' 5,601 boys completed the four questionnaires.

Factor analysis of the intercorrelations between the scales showed that the boys were rating the concepts largely in terms of three basic dimensions : ' Educational Success,' ' Toughness ' and ' Precocity.' Toughness which boys associate with smoking appears to provide an incentive both for non-smokers to take up smoking and for smokers to continue to smoke. Smokers also associate smoking with Precocity, an attribute which they think non-smokers lack. Although the smokers' Precocity does not have much attraction for non-smokers the value smokers place on it provides an incentive for them to go on smoking. The one attribute non-smokers have which is attractive to smokers, even though they feel they lack it, is Educational Success. This last finding casts doubt on the theory that smokers have identified themselves with an out-of-school youth culture, which is completely antagonistic to the adult values represented by the school.

I.—INTRODUCTION.

THIS study is part of a programme of research carried out by the Government Social Survey in order to aid the Ministry of Health's anti-smoking campaign. (Bynner, 1967, 1968; McKennell and Thomas, 1967; McKennell, 1968). The captive audience which school children provide, and the notion of ' catching them before they start,' has led to numerous campaigns in the schools to reduce smoking. But whenever these exercises have been accompanied by properly conducted evaluation studies the results have invariably proved disappointing (Cartwright, Thomson, *et al.*, 1960 ; Jefferys and Westaway, 1961 ; Horner, 1962 ; Jefferys, 1963 ; Watson, 1966 ; Erikson, 1966 ; Jeffreys, *et al.*, 1967). In a recent survey, also, the recollections of older adolescents failed to indicate that the policy towards smoking of the school they had attended made any difference to their subsequent smoking behaviour (McKennell and Thomas, 1967). Though the campaigns held in the schools rest on assumptions, usually unstated, about the attractions which smoking has for children, there do not appear to have been any previous empirically based investigations in this area. The present study focuses on one aspect of the problem, namely on the way children perceive themselves in relation to the smokers and non-smokers among their peers.

The broad hypothesis underlying the study resulted from a series of informal group discussions held with children. The general framework of the children's comments suggested that the smokers and non-smokers among them were conscious of belonging or not belonging to a smoking fraternity or the non-smoking community, and had distinctive perceptions of themselves and of their peers accordingly. The content of the measuring instrument developed to quantify and test these initial impressions was also derived from the informal interviews and refined following further quantitative pilot work. The instrument may be regarded as a semantic differential in so far as the basic elements of the procedure pioneered by Osgood *et al.* (1957) are retained. Four verbal concepts, ' the self,' ' the ideal self,' ' the smoker,' ' the non-smoker,' are each rated against a set of 19 bi-polar scales and the ratings are factor analysed. The position of each concept, and any differences in this position between groups of subjects, can then be charted in the ' semantic space ' defined by the factors. The initial development stages, however, mark a deliberate departure from the customary use of this technique. No attempt was made either to use scales from Osgood's published work or to refer to the main dimensions of semantic space which feature in this work. The factor structure sought was that which would best reveal the main dimensions along which children identify or fail to identify with the smokers and non-smokers among their peers. The choice of concepts to be rated followed from this objective of quantifying the identification process. The choice of rating scales was determined by the results of the prior exploratory research.

At the time the investigation was carried out there appeared to be no published instances of the application of the semantic differential using children as subjects. In order to simplify the task for the younger, less intelligent children in the sample, therefore, a decision was taken to use rating scales with three points rather than the seven points recommended by Osgood. Di Vesta and Dick (1966) have since shown that results reliable enough for discriminating between large groups can be obtained from even younger children using seven-point semantic differential scales. The number of scale points, however, appears to be a technical detail, the importance of which has probably been over-rated. Peabody's (1962) work and also that of Komorita and Graham (1965) indicate that when scores are obtained by summing the ratings on a battery of bi-polar scales, the number of points on the individual scales makes little or no difference to the reliability of the total score.

II.—METHOD.

Four semantic differential questionnaires were used in the study. Each questionnaire consisted of the same 19 bi-polar scales against which the boys had to rate each of the four concepts : ' the kind of boys who smoke cigarettes,' ' the kind of boys who do not smoke cigarettes,' ' the kind of person you are,' ' the kind of person you would like to be.' The questionnaires were designed on the basis of a series of exploratory studies which led up to the main research. A preliminary study in which discussions were held with four groups of boys and four groups of girls aged 13–14 and two groups of boys aged 11–12 (smokers and non-smokers separately) from secondary modern schools, suggested hypotheses about the factors motivating children to start smoking; and drawing upon the content of their remarks, a large number of questionnaires were designed to investigate these hypotheses. After a pre-test of the questionnaires modifications were made to them and they were then used in a pilot survey of 1,180 boys and girls in the first and fourth years of 20 secondary schools (grammar, comprehensive and secondary modern). The pilot questionnaires included four semantic differentials with 50 scales each. The pilot survey data were analysed with two aims in mind: first, to eliminate all items which did not discriminate between smokers and non-smokers ; and secondly, to reduce the number of items without losing any of their main components. This second aim was achieved by factor analysis which pointed to clusters of correlated items within different topic areas. A smaller number of items was then selected to represent each cluster. In the case of the semantic differential questionnaires the analysis led to a reduction from 50 bi-polar scales to the 19 which were finally used in the main survey.

Besides improving the content of the questionnaire the pilot work also led to improvements in the procedure for administering them and in the instructions for their completion. An example of the instructions which appeared on the questionnaires in the main survey is shown below.

You have told us a bit about yourself, now we would like you to tell us about some different kinds of boys you know. First, think about

THE KIND OF BOYS WHO SMOKE CIGARETTES

Here is a practice question about boys who smoke cigarettes.

Often go to the cinema ☐ ☐ ☐ Don't often go to the cinema

If you think that boys who smoke cigarettes often to the cinema, put a tick (like this √) in the box in the LEFT. If you think that boys who smoke cigarettes *don't* often go to the cinema, put a tick in the box on the RIGHT. Most people find it quite easy to choose one of these two answers. But if you really cannot decide which answer to give, put a tick in the box in the MIDDLE.

That question was just for practice. Underneath you will find some more questions of the same kind about *boys who smoke cigarettes*. Put a tick by each of the questions in the box which is right for *boys who smoke cigarettes*.

B.I. Good at school work ☐ ☐ ☐ Not so good at school work
Score 1 Score 2 Score 3

In the main survey, 5,601 boys aged 11 to 15 completed the questionnaires.* They were members of the sample used in the larger research into smoking among school boys of which this study was part. The sample was selected from 60 schools, comprising 10 boys-only grammar schools, 10 mixed grammar schools, 10 boys-only secondary modern schools, 10 mixed secondary modern schools, 10 boys-only comprehensive schools and 10 mixed comprehensive schools. Each set of 10 schools was selected at random, from all the schools of the same type in England and Wales. From each school four classes were selected for study. Within each boys-only school one class was selected at random from all the classes in each of the first four school years; within each mixed school two classes were selected at random from all the classes in each of the first four school years and the boys in them combined to form one class for the purposes of the study. Each group of boys worked under the supervision of a team of three or four field workers, following a classroom self-completion routine developed at the pilot stage. The team leader introduced the survey as an inquiry into leisure habits and opinions, and explained to the class how to complete the questionnaires using wall charts with specimen questions on them. The introduction stressed the confidential and anonymous nature of the replies. No member of the school staff was present during a test session, and the boys were explicitly asked not to write their names on the questionnaires.

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* The large sample size was necessary in order that detailed analysis of the data (in other parts of the study) could be carried out within different age-groups in different types of school. The main survey was restricted to boys because the pilot work showed that there were too few girls smoking in the age group 11 to 15 to make a sample-survey investigation feasible.

III.—FACTOR ANALYSIS.

Product moment correlation coefficients between each pair of scales were obtained, using simple scale scores (1, 2, 3) summed across the four concepts. The resulting 19 × 19 matrix (Appendix) was factor analysed employing the principal components method (with unity in the diagonal of the correlation matrix) followed by rotation to oblique simple structure using the Promax criterion (Hendrickson and White, 1964). Only the first three principal components, accounting for 59 per cent of the total variance, had latent roots equal to or greater than 1, and in accordance with Guttman's criterion (Guttman, 1954) only these were rotated. The correlations between the three rotated factors were as follows : r I.II= —·24, r I.III= —·37, r II.III=+·40. Table 1 shows the factor loadings.

TABLE 1

FACTOR LOADINGS.

Factor	Scales		I	II	III
	+	—			
I	1. Good at school work	: Not so good at school work	77	04	09
	2. Good at sports	: Not good at sports	78	18	10
	3. Usually does as told	: Often disobedient	72	—07	—09
	4. Acts own age	: Tries to act big	78	—03	—08
	5. Plans and thinks ahead	: Cannot wait, wants everything at once	81	—01	06
	6. Neat and clean	: Scruffy	83	—01	02
	7. Does not bully	: A bit of a bully	73	—11	—07
	8. Does not do forbidden things	: Likes to do forbidden things	65	—08	—16
	9. Does not swear	: Sometimes swears	53	09	—29
	10. Saves his money	: Spends his money	67	02	—14
	11. Often successful	: Often a failure	82	09	12
II	12. Tough	: Gentle	—42	60	—12
	13. Likes to be with a group	: Likes to be alone	—05	40	27
	14. Good fighter	: Not much of a fighter	09	77	01
	15. Has many friends	: Has one or two friends	35	39	32
	16. Tough	: A bit of a cissy	04	84	—14
III	17. Interested in girls	: Not interested in girls	02	—05	89
	18. Wants to be grown-up	: Does not yet want to be grown up	—18	07	29
	19. Tries to attract girls.	: Does not try to attract girls	—08	—05	85

(Decimal points omitted.)

The names which have been given to the three factors attempt to summarise broadly the content of the scales loading most highly on them. Factor I was the most difficult factor of all to label because of the wide range of attributes which it embraced (neatness, cleanliness, success at school work and sport, ability to plan and think ahead). It was called ' Educational Success,' but it should be borne in mind that in this context this term implies far more than success at school work alone. Factor II was not so difficult to define ; though moderately associated with sociability (likes to be with a group, has many friends), it was much more strongly linked to toughness and the ability to fight, and was therefore called ' Toughness.' Finally, Factor III was labelled ' Precocity,' because it represented the attainment of a kind of maturity which is not desired by many boys in this age group, that is, it signified interest in girls and a desire to attract them together with wanting to grow up.

Using the regression method (Harman, 1960) factor scores were computed for each boy and standardised for the whole sample (mean=0 and variance=1). A boy's image of a particular concept could thus be described in terms of 3 comparable factor scores—an Educational Success score, a Toughness score and a Precocity score.

The next step was to compute mean scores for various sub-samples of the total sample. For this purpose the boys were divided within each school year into three groups : smokers, defined as boys who said they were smoking one or more cigarettes a week ; triers, who had tried smoking more than one cigarette but at the time of the study were either smoking less than one cigarette a week or had given up smoking ; and non-smokers, who had never smoked or had only ever smoked one cigarette. In presenting our findings we shall be making comparisons between the images held by these various groups in terms of mean scores on each of the three factors taken in turn.

In interpreting the results the simple assumption is made that a boy will be motivated to change his behaviour in such a way as to make himself as similar as possible to the kind of boy he would like to be. Thus, if the score he gives his image of the smoker corresponds to the score he gives his ideal self with respect to a particular factor, then this feature of smoking holds a positive attraction for him and he will be motivated to smoke because of it. Similarly, if he gives his ideal self and his image of the non-smoker comparable scores on a particular factor, then this characteristic is putting him off smoking. In addition a difference between his self image score and his ideal self score can be taken as an indication of dissatisfaction with his self image, and therefore, a potential for change.

IV.—RESULTS.

Table 2 illustrates the relationship between the four concepts in terms of Educational Success, Toughness and Precocity. Mean scores for each image are given for the smokers, triers and non-smokers, separately. The relative positions of the concepts in terms of each factor are shown in Figure 1. Each of the three factors will be considered in turn.

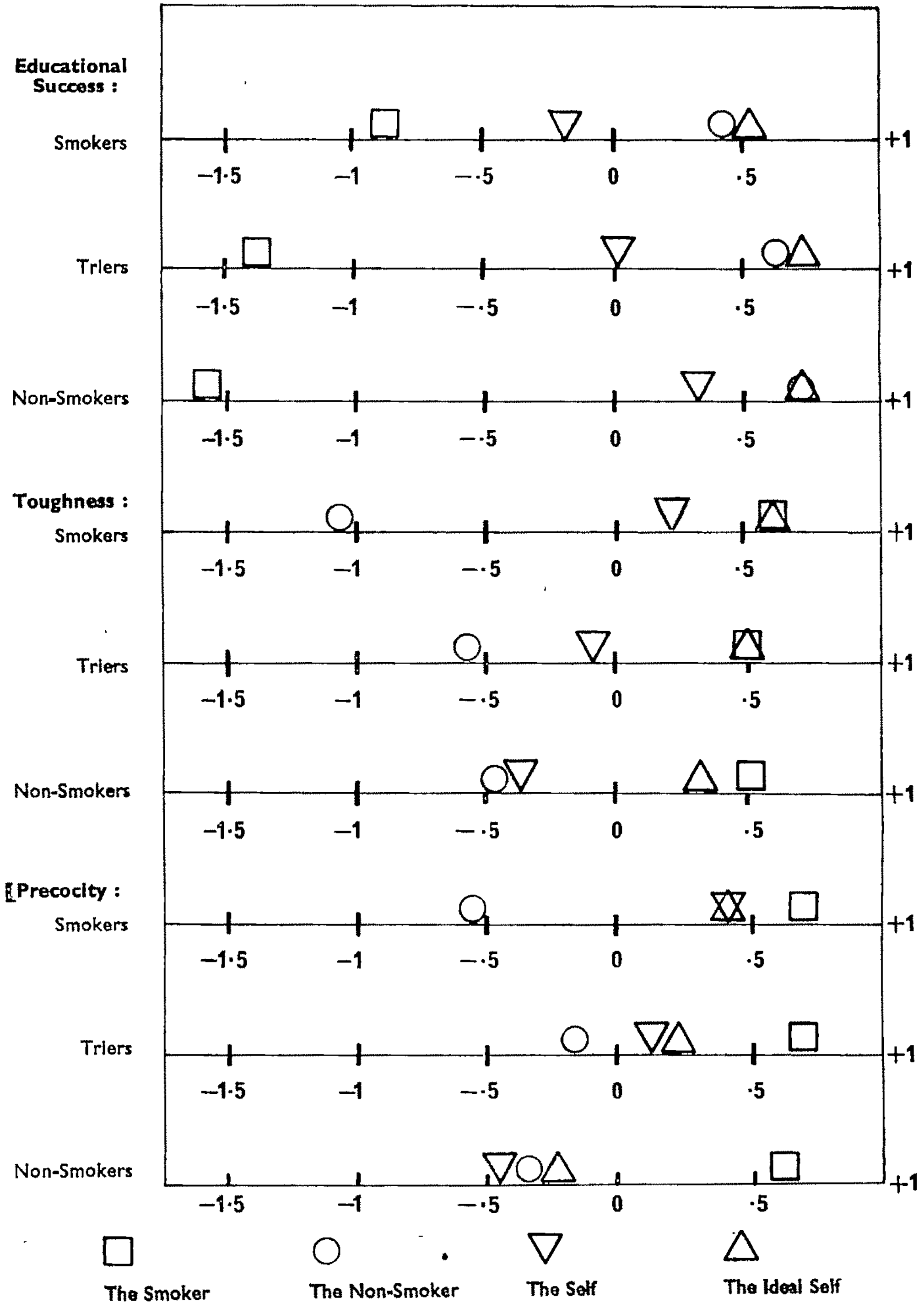
TABLE 2

IMAGES IN TERMS OF EDUCATIONAL SUCCESS, TOUGHNESS AND PRECOCITY.

Smoking Category	Educational Success				Toughness				Precocity			
	The Non-smoker	Self	Ideal Self	The Smoker	The Non-smoker	Self	Ideal Self	The Smoker	The Non-smoker	Self	Ideal Self	The Smoker
Smokers	+·4	—·2	+·5	—·9	-1·1	+·2	+·6	+·6	—·6	+·4	+·4	+·7
Triers	+·6	0	+·7	-1·4	—·6	—·1	+·5	+·5	—·2	+·1	+·2	+·7
Non-smokers	+·7	+·3	+·7	-1·6	—·5	—·4	+·3	+·5	—·4	—·5	—·3	+·6

FIGURE 1

IMAGES IN TERMS OF EDUCATIONAL SUCCESS, TOUGHNESS AND PRECOCITY.



(i) *Educational Success.*

Considering the Educational Success scores first, it is clear that most boys, including those who smoke, think of the typical smoker as being a failure educationally, whereas they see the typical non-smokers as being successful. But as might be expected, the typical smoker appears to be less of a failure in the eyes of the boys who smoke themselves. It is also the case that the typical non-smoker appears slightly less successful in the eyes of smokers than he does in the eyes of the boys who do not smoke.

The second point to be noted is the difference between the Educational Success scores for ' the self ' and ' the ideal self.' Each group of boys clearly values Educational Success because they give their ' ideal self ' a high score on it. They give ' the self ' a lower score which suggests that they would like to be more successful than they feel they are at present. It is clear that smokers set their sights slightly lower than non-smokers; but they do appear to value Educational Success. It is also apparent that they see themselves as being failures in comparison with non-smokers.

(ii) *Toughness.*

In complete contrast to Educational Success, Toughness is a dimension which represents an attractive aspect of smoking to most boys. As can be seen from the Toughness scores for the ' ideal self ' in Table 2, all three groups of boys value Toughness even though, particularly in the case of non-smokers, they feel they have a long way to go in order to achieve it. Most of them think that the typical smoker is tough and that the typical non-smoker lacks Toughness. The level of Toughness which they assign to the smoker is the level they would like to achieve for themselves, and this suggests that boys are strongly attracted to smoking by the Toughness which it represents.

The major differences between the three groups exist in the scores given to ' the self.' Boys who smoke think of themselves as being fairly tough, but not as tough as they would really like to be. They, more than any other group, see non-smokers as completely lacking Toughness, and thus the act of giving up smoking involves identification with a group which has this unattractive characteristic. For triers the situation is modified, but only slightly. They still value Toughness, but in comparison with smokers, they feel that they have further to go in order to achieve it, and they are not quite so convinced that non-smokers lack Toughness. Non-smokers differ from triers in seeing themselves as being even less tough—about as tough in fact as the typical non-smoker—but like triers they do value the Toughness which they think has been achieved by the typical smoker. In their case, however, although they want to be tougher than they are at present they do not want to be quite as tough as the typical smoker. It looks as though they feel that smokers have gone a little too far in trying to achieve Toughness.

In relation to Educational Success there was hardly any change in the scores for the four images, as the boys' ages varied. This was not the case for Toughness in one important respect as is shown in Table 3. In this table, mean factor scores for the images are shown for each group of boys, in each of the four school years. The main point to note is that although the mean Toughness scores of the ' non-smoker,' the ' smoker ' and the ' ideal self ' do not change much, the mean score of ' the self ' *decreases* as the boys get older.

It seems that the younger boys would like to be tough and if they smoke now or have ever tried smoking they feel that they have achieved a reasonable degree of Toughness. But as they get older they apparently realise that they are not as tough as they would like to be. They still value Toughness as much

TABLE 3

VARIATIONS IN TOUGHNESS AND PRECOCITY OF IMAGES WITH SCHOOL YEAR.

Smoking Category	School Year	Toughness				Precocity			
		The Non-smoker	Self	Ideal Self	The Smoker	The Non-smoker	Self	Ideal Self	The Smoker
Smokers ……	4	-1·1	0	+·6	+·6	—·5	+·5	+·5	+·8
	3	-1·1	+·3	+·6	+·5	—·6	+·5	+·4	+·7
	2	-1·0	+·3	+·6	+·6	—·6	+·3	+·3	+·7
	1	-1·1	+·4	+·6	+·6	—·7	+·3	+·3	+·6
Triers ………	4	—·6	—·3	+·5	+·4	0	+·2	+·3	+·7
	3	—·6	—·2	+·5	+·5	—·2	+·1	+·2	+·7
	2	—·7	0	+·5	+·5	—·4	0	+·1	+·7
	1	—·7	+·1	+·6	+·5	—·4	—·1	0	+·5
Non-smokers ..	4	—·5	—·5	+·3	+·5	0	—·2	+·1	+·7
	3	—·5	—·4	+·2	+·5	—·3	—·4	—·2	+·6
	2	—·5	—·4	+·4	+·4	—·5	—·6	—·4	+·5
	1	—·6	—·2	+·4	+·4	—·6	—·8	—·6	+·5

Entries in Tables 2 and 3 are the mean standardised scores of the group on the left for the concepts at the top of each column.

as they did when they were younger, but they now feel that they have much further to go in order to achieve it. Throughout the four years most boys think of the smoker as being very tough—as tough in fact as they would like to be themselves. Only non-smokers set their ideal level of Toughness slightly below the level they think has been achieved by the typical smoker, and even then this gap, noted earlier (Table 2), occurs only in the third and fourth years.

Precocity.

Precocity, like Toughness, also represents an attractive aspect of smoking but it differs from toughness in appearing to provide more of an incentive for smokers to continue to smoke than for non-smokers to take up smoking.

As can be seen in Table 2 all three groups of boys tend to think that the typical smoker is much more precocious than the typical non-smoker. They also appear to be reasonably content with their own images as far as this dimension is concerned. But there are marked differences between smokers and non-smokers. Smokers identify themselves fairly closely with the typical smoker; boys who have never smoked identify themselves with the typical non-smoker. Triers place themselves half-way between the typical smoker and the typical non-smoker.

The scores of the images on the Precocity dimension for all three groups bear a resemblance to the scores of the images held by non-smokers on the Toughness dimension. It may be recalled, that although non-smokers appear to value Toughness, they do not want to be quite as tough as the typical smoker. In the case of Precocity this distancing of ' the smoker ' from the ' ideal self ' is very clearly seen and occurs for all groups, becoming extreme for the non-smokers. Although this dimension represents the achievement of a certain kind of maturity, it clearly has some negative features even for smokers. The striving of smokers to appear grown-up is clearly disapproved of by many boys, particularly those who do not smoke.

Further aspects of this general picture are shown in Table 3 where we can again examine the variation in the mean factor scores of the images as the boys get older. In this part of the table far less stability is revealed than was the case for Toughness. Only the image which each group holds of the typical smoker maintains much the same score over the four years.

As non-smokers and triers get older they come to value Precocity more; but as their ideal changes so does their image of themselves and of the non-smoker. There is a steady movement of all these images towards the image of the typical smoker, which suggests that the older ones are coming to see this dimension more in terms of a desired maturity than of a precociousness which they do not want to achieve. In spite of the fact that they do not smoke, this kind of maturity becomes increasingly attractive to them, partly perhaps because they think that the typical non-smoker is now achieving it. Although at no stage do they want to identify themselves completely with the typical smoker, features of his behaviour in which they have very little interest in the first year, become acceptable and are indeed valued by them by the time they have reached the fourth year.

It is the smoker who sees the typical non-smoker as completely lacking the maturity which he values for himself. Even in the fourth year, boys who smoke still see the typical non-smoker as being very immature, whereas they feel that they personally have reached a high level of maturity. Although they do not appear to identify themselves completely with the typical smoker, they could clearly find it much more difficult, and would have much less desire, to identify themselves with the typical non-smoker, which would be implied by the act of giving up smoking.

V.—DISCUSSION AND CONCLUSIONS.

The findings have implications for health education, for education in the wider sense and for the methodology of this type of investigation into children's attitudes. The study has isolated three factors, 'Toughness,' 'Precocity' and 'Educational Success,' which appear to be the main dimensions along which boys aged 11 to 15 identify with the smokers or non-smokers among their peers. It is the Toughness dimension which is most strongly associated with smoking. This factor, combining elements of masculinity with a kind of gang solidarity, not only bolsters the self-esteem of the smokers, but is the one quality non-smokers attribute to smokers which they too would like to possess. Smoking as a maturity symbol, on the other hand, though very attractive to those who set a high value on Precocity, has hardly any attraction for those who do not. Precocity here refers not so much to maturity on an adult pattern as to a more specialised interest in attracting the opposite sex. The typical non-smoker is not in a hurry to be 'grown up' in this sense. He looks for and feels he achieves ascendancy in another direction—in terms of the values associated with Educational Success. In this one direction, also, the superiority of the non-smoker is acknowledged by the smoker.

Anti-smoking appeals addressed to children might be made more effective if ways could be found for taking the above attitudinal factors into account. Most obviously, it would be useful if smokers could be encouraged to believe that the non-smoker is not lacking in toughness or maturity, even though he is able to achieve some of the conventional educational goals. But the attitudes boys hold towards themselves and their contemporaries need to be interpreted against a still wider background. It can then be seen that the obstacles to communication in the school setting encountered by health educators have much in common with those which beset educators generally. It has been suggested by some

American writers (e.g., Davis, 1940 ; Coleman, 1961) that adolescents create a separate ' teenage society ' or ' youth culture ' for themselves which maintains separate values and modes of behaviour from adult society. Sugarman (1967) has taken this view further by arguing that in England adolescents are faced with a choice of identifying themselves with the ' pupil culture ' of the school which aspires to adult (middle class) values of conventional achievement, or with the ' youth culture ' which operates outside the school and is more working class in orientation. He uses smoking as one of his indices of identification with the youth culture. Data reported elsewhere (Bynner, 1968) show that smokers are attracted more than non-smokers to such activities as 'coffee bars', ' dances ' and ' going out with girls,' and that they are more interested than non-smokers in ' clothes ' and ' pop records.' All of these interests are characteristic of ' youth culture ' as described by Sugarman. It might be inferred from our present data that the toughness and maturity which smokers value symbolise the male ideal in the youth culture ; the association of smoking with these attributes helps the smoker to gain esteem in the eyes of his friends. If this is so it seems possible that unless great care is taken, anti-smoking campaigns held under *school* auspices may reinforce the symbolic value of smoking as a means of achieving status in the out-of-school youth culture.

But this hypothesis tends to overlook our other findings about the relation between smoking and Educational Success. Several writers have found an association between smoking and low academic achievement (Raven, 1957 ; Horn, 1959 ; London School of Hygiene and Tropical Medicine, 1959 ; McArthur 1961 ; Mausner and Mischler, 1967). This association is supported by our own data which show that smokers tend to be in the low achievement groups at school (Bynner, 1968), and that they acknowledge their poor educational performance (Table 2). But we also found that the smokers' low achievement is not accompanied by a tendency for them to reject the values associated with Educational Success. This finding is in some ways surprising. Disavowing standards by which one falls short is certainly one mechanism for preserving self-esteem. Non-smokers adopt this course, for example, with respect to Precocity (but not Toughness). The smokers however react differently with respect to Educational Success. The low rating they give their self-concept on this dimension shows that they are conscious of their weakness at school, but the high rating they give their ideal self indicates that their self-esteem is involved (Table 2). No doubt the achievement of status by other means becomes all the more important to them for this reason ; but on present evidence they do not resort to the further strategem of devaluing Educational Success as an ideal. Sugarman concluded from his study that identification with the youth culture is accompanied by a complete rejection of conventional educational goals. Our finding that smokers do not reject these goals, even though they do show many of the other features of identification with ' youth culture,' casts doubt on the validity of the concept of youth culture as Sugarman describes it. If there is a ' teenage society ' in conflict with adult values, and some writers have disputed this (e.g., in North America, Elkin and Westley, 1955, and in England, Musgrove 1964), it seems that the smoking members of this society, at least, share more in common with adults than we might have expected. In the sample for which this analysis was carried out, grammar schools and comprehensive schools were over-represented and secondary modern schools were under-represented. It may be the case that analysis within different types of school, which we hope to report later, may show more devaluation of educational success in the less academic types of school. But on present evidence this seems unlikely. The incidence of smoking was only slightly lower in the grammar schools than in the other types of school, and did not differ between comprehensives and secondary moderns. And unless comprehensive schools have adopted completely the academic orientation of the grammar school—which seems unlikely—their strong representation in the sample would tend to cancel out any grammar school bias. From present data, therefore, health educators may take some comfort. It seems that smokers generally do not reject the values that the school is trying to put across. To assume that these values are repudiated may be to overstate the consequences of involvement in youth culture and to overlook psychological elements in the individual child's adjustment which could be of considerable value to educators.

What seems to be important in further research in this area is that justice should be done to the complexity and ambivalence present in the children's outlook. These aspects can easily be masked by conventional attitude scales which measure only the overall degree of favourability or unfavourability towards a single object, such as the school, which is really a complex topic area. The semantic differential technique marks an advance in that it allows relationships between several facets of the same topic to be compared within a multidimensional framework. Yet in the customary application of this technique the reference framework consists of the factors Evaluation, Potency and Activity which Osgood, *et al.* (1957) showed consistently, in a number of studies, to reflect the main dimensions of connotative meaning. For their pioneer work on meaning, however, Osgood, *et al.*, deliberately factored large heterogeneous sets of scales and concepts. More recent studies (Triandis, 1960 ; Husek and Wittrock, 1962) have shown that when the sample of scales and concepts is purposively restricted to a limited topic area, the resulting factor structure can vary considerably with the subject matter. The loss of generality in being unable to refer results to the dimensions of a universal semantic space is more than compensated for when the factors isolated bear more penetratingly on the special problem under investigation. Thus although some relationship can be traced between the factors Educational Success and Toughness and the Osgood factors Evaluation and Potency, it is the differences which are particularly important for this study. According to Osgood the evaluative dimension is orthogonal to other components of meaning, and is the only dimension identifiable as the attitudinal component. The three factors in the present study are oblique rather than orthogonal (the correlations are given in Section III), and all three can be given an evaluative interpretation in terms of the ratings on them of the ideal-self concepts. This splitting of the evaluative component into several factors provides a model for the measurement of ambivalence, as the same concept can be rated high on one dimension and low on another. Such a model seems essential for analysing the cross-pressures generated by conflicting role situations. At the same time, in departing from the generalised measurement model provided by Osgood, a fresh problem arises of how adequately to sample the content area of interest. The coverage of test items selected on *a priori* grounds may be unduly narrow or biased. In a very real sense one gets out of statistical analysis, however elaborate, only what is put in ; and any questionnaire measuring instrument runs the risk of being prematurely standardised about its designer's preconceptions. These considerations, general to all attitude measurement, seem particularly pertinent where children are under study. The preliminary informal discussions with children, the use of their spontaneous comments in constructing rating scales and the extensive piloting and factoring of a larger battery of scales than need be used at the final stage are felt, accordingly, to be essential steps for the development of measuring instruments for this type of study.

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VII.—APPENDIX.

CORRELATIONS BETWEEN THE SCALES.

Factor		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
I	1	100	50	50	50	53	54	48	45	42	46	57	–33	–18	–01	09	–06	–18	–18	–21
	2		100	43	51	51	53	45	41	35	43	54	–27	–11	09	17	–01	–13	–18	–18
	3			100	63	57	61	59	62	49	55	50	–42	–22	–16	01	–13	–29	–24	–35
	4				100	63	69	68	58	44	56	57	–43	–20	–16	05	–10	–30	–27	–39
	5					100	61	57	51	42	54	58	–38	–21	–06	09	–08	–21	–21	–27
	6						100	62	57	44	55	59	–41	–18	–11	09	–07	24	–21	–31
	7							100	58	48	53	51	–45	–22	–18	01	–13	–29	–25	–36
	8								100	49	52	45	–41	–22	–18	00	–14	–31	–23	–37
	9									100	51	38	–29	–21	–06	–03	–08	–30	–21	–31
	10										100	47	–35	–21	–10	01	–10	–27	–24	–32
	11											100	–31	–14	01	14	–04	–16	–18	–21
II	12												100	31	36	07	37	26	20	29
	13													100	22	27	27	30	16	28
	14														100	21	42	24	12	25
	15															100	20	16	05	13
	16																100	19	15	17
III	17																	100	22	67
	18																		100	24
	19																			100

The matrix has been rearranged so that variables having high loadings on a particular factor are next to each other. Decimal points omitted.

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A COMPARATIVE STUDY OF PERSONALITY, INTELLIGENCE AND SOCIAL CLASS IN A TECHNOLOGICAL UNIVERSITY

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SUMMARY. 607 freshmen in the 1966 intake at the University of Bradford completed a personality inventory and the Nufferno intelligence test. The mean extraversion score was lower than those obtained from traditional university samples, but higher than the normal population. Undergraduates at Bradford were more neurotic than the normal population and the arts specialists, particularly the women, were more neurotic than the men scientists. Women science specialists were substantially more intelligent and extraverted than any other group in the sample. Appreciably higher intelligence scores were obtained by science and technology students than by arts and social sciences, but within these subject areas there were no social class differences. In keeping with other studies in technological institutions, proportionally more students were recruited from working class homes than is experienced by established universities.

I.—INTRODUCTION.

RESEARCH has shown that higher educational institutions tend to select, sometimes unwittingly, students with atypical cognitive and affective styles. For example, the personality characteristics of introversion and neuroticism appear to be advantageous traits for university academic attainment. Between the various institutions of higher education there are different attractions and demands, not only intellectual but technical and social as well, which will be revealed as variations in the characteristics of their students. Cattell and Warburton (1961), in a cross-cultural study of extraversion and anxiety in American and British students, found those in a British college of advanced technology to be much less anxious and more extraverted than those in a British university. Comparisons of college of education and university students (Evans, 1964) indicate that college students are more extraverted than, but similar in mental speed and accuracy to, undergraduates.

The contrast in personality traits of arts and science specialists represents another area of investigation. Studies using personality tests suggest that successful students in literary and artistic subjects in universities tend towards extraversion rather than introversion (Warburton, 1964). Biographical and retrospective studies (Roe, 1953, and MacKinnon, 1962) point to self-confidence, ambition, perseverance, a will to work with single-mindedness and to avoid personal relationships and complex emotional situations as symptomatic of eminent scientists. Bereiter and Freeman (1962) found that arts specialists were more concerned with people, were sociable, were sensitive to their own emotions and liberal in outlook and attitude.

A most striking contrast at sixth form level was indicated by Hudson (1963) who noted that science specialists distinguished themselves from the arts specialists by tending to be conformist, much less given to emotion, interested in practical hobbies and outdoor pursuits, humourless, pacifist and careful. These attributes read very much like those of the classic stable introvert in Furneaux's studies (1962).

In many respects, it would seem reasonable to expect the differential influences of social background to give rise to anomalies between, for instance, the personalities of members of the classes in the Registrar-General's Classification by Occupations (1960). However, there is very little evidence on this matter. Eysenck (1959, 1964) and S. B. G. Eysenck (1960) did not detect any significant variations for adult samples, whilst Child (1966) found that the children of parents classified in I and V (Registrar-General) were introverted when compared with those from class III and the test norms of the Junior Maudsley Personality Inventory (Furneaux and Gibson, 1961).

Another distinction has been drawn between arts and science students in the researches of Hudson (1966). Using bright fifth and sixth formers he concluded that science specialists, particularly physicists, tended to obtain higher scores on conventional IQ tests than did arts specialists (history, literature and modern languages).

This study attempts to inter-relate the personality traits, intelligence and social class background of arts with social science students and science with technology students in a technological university.

II.—THE INVESTIGATION.

The majority of freshmen in the October, 1966, intake at the University of Bradford, were asked to complete the Eysenck Personality Inventory (Eysenck and Eysenck, 1964) and the Nufferno Level Test (Furneaux, 1956) at the beginning of their first term. Other personal details such as parental occupation and subject choices were obtained from information gathered in the course of a more extensive preliminary inquiry in the University (Musgrove, *et al.* 1967). The final sample, which amounted to 92 per cent. of the total October entry after the elimination of incomplete and unreliable test forms, consisted of 504 men and 103 women.

For the purposes of this analysis the sample was divided into two broad categories of the arts plus social sciences and the sciences plus technology students according to the schools in which they were reading for degrees. The first category was made up of students from Modern Languages, Management and Administration, Applied Social Studies and Social Sciences. The science and technology students represented a wide range of scientific specialisation including mathematics and statistics, biology, optics, textiles, civil, chemical, mechanical and electrical engineering, pharmacy, physics and chemistry.

III.—STATEMENT OF RESULTS.

(*a*) *Personality factors.*

The mean extraversion and neuroticism scores for the whole sample with the quoted norms for student and normal populations given in the EPI manual are displayed in Table 1. The Bradford sample was significantly introverted (C.R.=2·03, $p<0{\cdot}05$), when compared with the population, but extraverted (C.R.=2·08, $p<0{\cdot}05$) when compared with the student norms. This is in line with the research of Cattell and Warburton (1961) and Evans (1964). The neuroticism scores revealed a marked tendency for Bradford students (along with Eysenck's student sample) to be neurotic (C.R.=3·85, p. $<0{\cdot}001$) as compared with the normal population. However, Bradford students were not noticeably different in their scores from Eysenck's university students—an observation in conflict with Cattell and Warburton's results.

TABLE 1

COMPARISON OF EXTRAVERSION AND NEUROTICISM MEANS WITH QUOTED NORMS.

Personality trait	Bradford sample N=607		Eysenck norms : students N=347		Eysenck norms : normal population N=2000	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Extraversion	11·7	4·2	11·1	4·5	12·1	4·4
Neuroticism	9·9	4·4	10·0	5·0	9·1	4·8

TABLE 2

EXTRAVERSION AND NEUROTICISM MEANS AND S.D.'S FOR ARTS AND SCIENCE MEN AND WOMEN.

Combination	Group	Neuroticism		Extraversion		N
		Mean	S.D.	Mean	S.D.	
	Whole sample	9·9	4·4	11·7	4·2	607
(a)	Arts women	11·9	4·3	11·7	3·9	58
	Science women	11·3	4·7	12·7	3·9	45
(b)	Arts men	10·3	4·1	11·5	4·5	107
	Science men	9·4	4·3	11·6	4·2	397
(c)	All women	11·6	4·5	12·1	3·9	103
	All men	9·6	4·3	11·6	4·3	504
(d)	All arts	10·9	4·2	11·6	4·5	165
	All science	9·6	4·2	11·7	4·1	442

When the arts and science specialists were considered separately and further subdivided into the sexes as in Table 2, a number of comparisons became possible. Dealing first with the neuroticism scores for the combinations (*a*) to (*d*), the first two show a tendency for the mean scores to decrease in the order arts women, science women, arts men, science men. The arts women were more neurotic than men from either specialism (arts women—arts men C.R.=2·3, $p<0{\cdot}05$, arts women—science men C.R.=4·1, $p<0{\cdot}001$), and at the other extreme the science men were more stable than the other three groups (science men—arts men C.R.=2·0, $p<0{\cdot}05$, science men—science women C.R.=2·6, $p<0{\cdot}01$, science men—arts women see above). As might have been anticipated, women were markedly more neurotic than men (combination (*c*), C.R.=4·17, $p<0{\cdot}001$) and the arts and social science students more neurotic than the science and technologists (combination (*d*), C.R.=3·42, $p<0{\cdot}001$).

Extraversion scores were very much alike for specialisms and sexes with the exception of the women scientists who were extravert as compared with men scientists (C.R.=1·98, $p<0{\cdot}05$) and Eysenck's students (C.R.=2·03, $p<0{\cdot}05$.)

(*b*) *The Nufferno Test.*

The Nufferno manual gives a score of 180 as the 50th percentile for first-year students, thus placing the Bradford sample mean (Table 3) at about the seventieth percentile. The science and technology specialists had a decidedly higher mean score than the arts and social science specialists (C.R.=4·73, $p<0{\cdot}001$), but no difference was noted between the scores for the sexes.

TABLE 3

NUFFERNO LEVEL TEST MEANS AND S.D.'S FOR ARTS AND SCIENCE MEN AND WOMEN.

Group	Nufferno Test		
	Mean	S.D.	N
Whole sample	252·8	65·1	604
Arts women	239·5	64·6	57
Arts men	227·5	67·0	107
Science women	287·0	62·1	45
Science men	257·5	64·1	395
All women	260·2	60·3	102
All men	251·3	66·7	502
All arts	231·7	68·2	164
All science	260·7	63·6	440

Women scientists had very high intelligence scores as compared with other groups (science women—science men C.R.=3·06, $p<0{\cdot}01$, science women—arts men C.R.=5·26, highly significant, science women—arts women C.R.=3·77, $p<0{\cdot}001$). Male arts students had significantly lower scores than science students (arts men—science men C.R.=4·14, $p<0{\cdot}001$, arts men—science women see above).

(c) *Social class background.*

The social class distribution of the sample in Table 4 is compared with data from the Robbins survey (1963) and Sandford, *et al.* (1965). There are striking similarities between the Bradford and Bristol students. Musgrove (1967), using the same sample as in the present study, found no significant difference in social class distribution between the arts and social science students and those used in the Robbins survey. However, the science and technology under-

TABLE 4

PERCENTAGE SOCIAL CLASS DISTRIBUTION (Registrar General's Classification).

Social class	Bradford undergraduates (1966)	Robbins undergraduates (1961)	Sandford, *et al.* Bristol C.A.T. (1963)
I	10·4	18·0	9·2
II	35·4	41·0	30·9
IIIA	13·9	12·0	—
IIIB	31·4	18·0	46·0
IV	7·4	6·0	6·8
V..................	1·5	1·0	2·4
Don't know	—	4·0	4·6
Total	100·0	100·0	100·0

graduates differed significantly and came more often from manual workers' homes. Kelsall (1957) likewise concluded that in British universities science and technology students came more often from the homes of manual workers than the arts students.

TABLE 5

SOCIAL CLASS, PERSONALITY AND SUBJECT CHOICE.

Social class	Arts and Social Sciences					Science and Technology					Totals				
	Neurot.		Extrav.			Neurot.		Extrav.			Neurot.		Extrav.		
	Mean	S.D.	Mean	S.D.	N	Mean	S.D.	Mean	S.D.	N	Mean	S.D.	Mean	S.D.	N
I	10·6	3·2	11·5	4·5	20	8·5	3·9	12·2	3·9	43	9·2	3·8	12·0	4·1	63
II . .	11·3	4·8	11·5	4·6	67	9·9	4·6	12·1	4·5	149	10·3	4·6	11·9	4·5	216
III	10·5	3·8	11·9	3·9	68	9 ·5	4·2	11·5	4·6	206	9·8	4·1	11·6	4·1	274
IV+V	11·0	4·1	9·9	4·7	10	10·2	4·3	11·4	3·8	44	10·3	4·2	11·1	4·2	54

The mean neuroticism and extraversion scores for students from various social class backgrounds were considered in two ways. In the first place, when students were grouped according to their subject areas (reading vertically in Table 5) the only significant distinction occurred between the means of class I and class IV+V for science and technology students (C.R.$=2{\cdot}10$, $p<0{\cdot}05$); class I had the lower score. Although the trend was for the extraversion scores to decrease from class I to class IV/V in both arts and science data, statistical significance was not reached. This observation supports Eysenck's researches with adult samples. However, compared with the scores for Eysenck's students (given in Table 1) it appears that Bradford's science and technology students from middle class backgrounds are more extraverted (class II, C.R.$=2{\cdot}26$, $p<0{\cdot}05$) and less neurotic (class I, C.R.$=2{\cdot}27$, p. $<0{\cdot}05$).

In the second instance, an analysis of scores for different specialist fields within one class (reading horizontally in Table 5) revealed that arts and social science undergraduates from professional and managerial homes were significantly more neurotic than their counterparts in science and technology (class I, C.R.$=2{\cdot}30$, class II, C.R.$=2{\cdot}00$, both $p<0{\cdot}05$).

TABLE 6

NUFFERNO MEANS AND S.D.'S BY SOCIAL CLASS BACKGROUND FOR ARTS AND SCIENCE MEN AND WOMEN.

Group	Social class											
	I			II			III			IV/V		
	Mean	S.D.	N	Mean	S D.	N	Mean	S.D.	N	Mean	S.D.	N
Arts men ..	224·7	65·3	12	227·5	75·7	40	229·6	70·2	46	221·0	72·4	9
Arts women ..	262·0	45·9	8	246·8	60·1	26	221·9	74·8	22	250·0	—	1
Science men	259·6	65·9	34	258·9	63·5	132	257·6	59·3	188	253·2	61·1	41
Science women	261·6	74·6	9	302·3	49·7	16	277·4	56·4	18	357·5	—	2
Arts total ..	239·6	61·1	20	235·1	70·6	66	227·1	71·8	68	223·9	69·2	10
Science total ..	260·0	67·8	43	263·6	63·6	148	259·3	59·3	206	258·0	63·7	43

A prominent feature in the analysis of the Nufferno scores with social class background (Table 6) was the higher intelligence scores attained by scientists irrespective of social class. Class II (C.R.=2·80, $p<0{\cdot}01$) and class III C.R.=3·31, $p<0{\cdot}001$) means in particular reached significance. Reading across the Table 6, there were no class distinctions between either the arts or science students.

IV.—DISCUSSION.

The notion that introversion is a characteristic of students in higher education is supported by the sample in this study. By definition, the introvert avoids personal situations and enjoys bookish and conceptual pursuits, all of which are rewarded by the present educational system. Further, there is some evidence to suggest that on average students exhibit different degrees of introversion, according to the institution involved. Clearly, if this is the case, the extent of the disparity between the normal population and the norms for students in particular educational institutions might be taken as an index of the academic demands made of those students. It will be recalled that using the normal population as the baseline, university students were most introverted whilst students in a technological university came next. Evans (1964) found similar trends between university and college of education students. A suggested research topic might be to examine and compare the personality profiles of students and the academic expectations in a variety of institutions of higher education.

Research findings on the relationships of neuroticism to other variables has been sparse and conflicting. For example, insufficient is known about the variation, if any, of individual or group neuroticism scores when they are obtained during particular problematical events in the lives of students. A possible exercise in this direction would be to give a sample of students a test of neuroticism on diverse occasions in the academic year (e.g., the first day at college or univeristy, just before or during a vacation, just prior to a major examination). On balance, students tend to be more neurotic than the population as a whole and women more neurotic than men. In this respect the Bradford sample is typical. Again, in keeping with the work of Roe (1953), MacKinnon (1962) and Hudson (1963), arts and social science students were more neurotic than the science and technology students. At the extremes one finds the unstable feminine, artistic temperament contrasted with the stolid, masculine, emotionally bleak scientist.

What kind of women are attracted into technology—a field which has been essentially a male province? The women scientists (N=45) in this sample were by far the brightest and most extravert of all the groups. Why these qualities in particular, should characterise the female science and technology student is not plain to see. Could it be, as Eysenck's researches suggest, that the extravert being less susceptible to social conditioning is in consequence less concerned about what others might think of irregular or unfeminine career choices?

The science and technology students have poorer academic records on entry than the arts and social sciences (see Appendix III, Musgrove, *et al.*, 1967). Nevertheless, the former have significantly higher intelligence scores derived from a technique which rewards persistence. This supports the evidence presented by Hudson (1966) in which science specialists performed much better than arts specialists in tasks requiring convergent rather than divergent thinking skills. The Nufferno test items require one conventional correct solution clearly obtainable from the information given (rather than the generation of a number of equally acceptable solutions as with divergent items) and provide good material for convergent thinking. This result, however, runs counter to Furneaux's who found that the separate distributions for arts and science students using the Nufferno test were almost identical. Since Nufferno scoring procedures reward persistence, which is an introvert characteristic, one would expect to see the science personality scores tending towards introversion. This was not the case ; in fact, the science women were exceptionally extravert.

Finally, the social class distribution was very similar to other studies involving colleges of advanced technology and the conclusion reached was that proportionally more students were being attracted from working-class homes into science and technology. It is thought by some (Furneaux, 1962) that neuroticism is a measure of drive level. If this is the case, students from the homes of semi-skilled and unskilled workers tend to have higher drive levels than other students specializing in the sciences.

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READING ERRORS AND SELF-CORRECTION BEHAVIOUR

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SUMMARY. If cues in redundant sources are cross-related it is often possible to detect that an error has been made. Evidence of self-correction behaviour in 5-year-old beginning readers is presented and the interpretation is made that an efficient information-processing strategy is developed by children who make good progress in learning to read. That such a strategy could be developed by young children at a stage of intuitive rather than logical thinking is best explained in terms of Neisser's concept of multiple thought processes which he considers appropriate for dealing with novel, irregular stimuli.

I.—INTRODUCTION.

THE redundancy of language codes enables us to understand messages when they are stripped of semantic or syntactic cues (Cherry, 1957), when they lose phonemic cues (Gimson, 1962), or when they contain errors and ambiguities. Because any word within a sentence fits a matrix of relationships—phonological, morphological, syntactic, semantic and graphic—a mature reader may use cues from one or more of these dimensions along which words differ. The beginning reader, by definition, has limited knowledge that these dimensions exist.

In the research reported below detailed records were gathered of early reading behaviour, at a time when the children were still stabilising their movements across print, building their visual images of letter and word forms, and discriminating the units in their own speech that had significance for reading behaviour. At this early stage of reading progress children noticed their errors and made efforts to correct them. Bruner's theory of perception as a decision process (1957) provides one framework for the discussion of such error-correction behaviour which would pass through stages of cue search, preliminary categorizing, confirming check and final categorization. Bruner (1966) also describes ways of representing reality by action sequences, by ikonic representation in images, and by symbols, and he suggests that when there is conflict between two systems of representing reality the child may search further to resolve the conflict. One is reminded also of Piaget's description of assimilation and accommodation processes by which psychological schemata are differentiated (Lunzer, 1960). Bolinger (1954) presents a description, from a linguist's point of view, of the search for identity in language units occurring at the levels of figure, part-to-whole, and coded comparison among linguistic units ordered hierarchically. Neisser (1963), who made a distinction between multiple and sequential thought processes, showed that visual searching for several cues at the same time is not only possible with adult subjects, but is a highly effective procedure (1964). He states that "multiple processing exhibits superior ability to deal with novel or irregular input" (1963, p. 1) and that "mental processes of this kind seem to be common whenever there are situations too complex for ready logical analysis" (1963, p. 2). Linguistic categories are highly irregular, the graphic representation of language is novel for beginning readers and children of this age are, according to Piaget, at a prelogical level of thinking. Is the young child capable of dealing with multiple relationships? Educationists have tended to think that their task was to simplify method and text in order to reduce the dimensions of difference in stimuli.

Some very intricate self-correction behaviour sequences occurred in this research. The observations showed that a child who was aware that ' something was wrong,' often went back over the line or tried several responses with the result that an error was frequently corrected. Signs of children's dissatisfaction with their own responses were frequently noted. They stopped, looked puzzled, complained, repeated the line, or ran a finger along a word. An unsuccessful attempt at self-correction can be quoted as an example.

A high progress reader aged 5 : 6 came to the text *Look after Timothy* and worked at the word *after* in this way :

(1) " It wouldn't be *at,* it's too long "

(2) " It wouldn't be *hats.*"
(This was semantically appropriate but linguistically awkward.)

(3) " It wouldn't be *are,* look, it's too long."
(The child pointed to *are* elsewhere on the page.)

(4) The problem was not resolved and the child left it.

(5) Three pages further on the word was read correctly.

It is exceptional for the school entrant to be able to state what he is doing in this way, and the verbalised reasons for the decisions of difference may not be the significant ones. In the above example the reasons for dissatisfaction that are verbalised are size and meaning but it should be noted that two of the three trials correctly categorise the stimulus *as a word beginning with ' a ' and all three have at least two letters in common.* The focus of this research was this overt self-correction behaviour of five-year-old readers. In a perceptual activity, such as reading, search and check behaviour may be assumed to occur :

(*a*) with a correct response, no error having occurred ;
(*b*) with an error response, no solution having been found ;
(*c*) with an error, subsequently corrected.

The error subsequently corrected can be recorded objectively but must represent the observable part of the iceberg. One might expect (*a*) and (*b*) to be related to (*c*) and the presence of self-correction behaviour may be diagnostic of processing that is not overtly observable.

II.—RESEARCH DESIGN.

Samples of the reading behaviour of 100 children were taken once *each week* during their first year at school.

Subjects : The subjects were children from five schools shown to be representative of the age group of a large urban centre in sex, parent occupation, intelligence and adjustment, and of national groups on reading readiness scores and the quality of instruction. Children with language experience other than English were excluded. The children were 5 : 0 to 5 : 2 on entry to school and 5 : 11 to 6 : 1 at the end of the study.

Classroom Programme : As a field investigation, the research sampled behaviour responses under natural learning conditions. The investigator exercised no control over the instruction the children received. All classes were following a published reading scheme (Simpson, 1962), with a standard set of reading books (N.Z. Department of Education, 1963). These books were written with the interests and natural speech of New Zealand children in mind. A distinction was made between two vocabularies : content words of high interest (which need not be accumulated in the learned vocabulary) and the heavy duty words of English (which should be learned). The teaching method emphasized instruction in response to errors during the course of reading rather than prior teaching of sounds or words singly or in lists.

Procedure: Once every week of the school year each child read to the investigator those pages of his reading book for which his lessons had prepared him since the last record was taken. For the preparatory stage before the child began reading the basic series the findings are mainly descriptive. The records for the book reading stage yield averaged tallies from longitudinal records of each child from the week he was promoted to the basic reading series until his sixth birthday. Therefore, children who were promoted to books early had more weekly records, and more satisfactory sampling of behaviour than children who spent longer in the preparation or readiness period and less of their first year on book reading.

At one session it was usual for a child to read a little book of 12 pages or a story unit of four to six pages from a larger book. Every response was categorised as true report, error, repetition, or self-correction. Motor responses having to do with directional and spatial qualities of the text, such as finger pointing and stressed vocal juncture, were recorded. The investigator was particularly careful to act as a recorder of, not a stimulus to, behaviour. Comments, teaching points, helpful replies, leading questions and pointing guides were avoided. Six observers trained for one hour on scoring taped recordings showed no significant differences from the investigator's original scoring for either errors, or self-corrections.

Analysis: Records were analysed one year after recording. A test of reading progress given at 6 : 0 divided the total group into four quartile groups called High (H), High Middle (HM), Low Middle (LM), and Low (L) progress groups. The test combined a word test of items selected from the basic readers on the basis of frequency, with the Schonell R.1 test (1956). For this combined test the internal consistency reliability was 0·97, the item difficulty range was from a z-score of +1·65 to −1·65, and a validity coefficient of 0·93 was obtained with accuracy on book reading. The confidence that could be placed in this assessment of progress overcame one of the major obstacles to studying early reading progress, namely, the unavailability of good measuring instruments. The significance of differences between the four progress groups was determined by Mann-Whitney U-tests, but the illustrative tables below report data for the median case of each quartile group.

III.—RESULTS.

Error-correction at the preparatory stage.

In the preparatory period locating behaviour (i.e., the child's attempts to find some print to match to the response he was giving) passed through several stages:

(i) from *page matching*, in which the child repeated a memorised text for the page without locating any detail in the print;
(ii) to *line matching* in which the child repeated a memorised line of print, locating that line as a whole;
(iii) to *locating some words* within a memorised line;
(iv) to *'reading the spaces'* and thus co-ordinating visually located word patterns with speech impulses and the spaces between words with vocal juncture.
(v) This led to a movement-speech mismatch when there were too few or too many spoken impulses for the number of patterns available, *or* a speech-vision mismatch when a spoken word failed to coincide with its known visual pattern during the co-ordinating process.

The movement-speech mismatch tended to precede the speech-vision mismatch developmentally. Some quantitative results support this description. (Note that each higher progress group spent less time in the preparatory period than each lower group, Table 1.)

TABLE 1

READING BEHAVIOUR OF THE PREPARATORY STAGE, REPORTED FOR THE MEDIAN CASE OF EACH QUARTILE GROUP OF 25 CHILDREN.

Quartile Progress Groups	Preparatory Stage		
	% Self-correction in last 3 records	Weeks to L—R consistency	Weeks in preparatory stage
H	100	7	16
HM	96	12	21
LM	94	20	31
L	64	15	36

(1) Consistent left to right movement across print in three consecutive behaviour records was established within seven weeks of school entry for the H group and 15–20 weeks for the LM and L groups. This action sequence was established many weeks prior to promotion to basic reading books (Table 1).

(2) In 90 per cent of the behaviour records self-correction behaviour was recorded at least three weeks *before* the children were promoted to basic reading books (Table 1).

(3) Records showed that 49 per cent of the children had passed from fluent inventing of the texts of caption books, to stressing the juncture between words at least three weeks prior to promotion to basic reading books, suggesting that these children had established a one to one correspondence between speech impulses separated by stressed vocal juncture and word patterns separated by spaces.

Before promotion to the basic reading books a high proportion of children (*a*) gave evidence of self-correction, (*b*) had established left to right sequencing of movement across print which could lead to a movement-speech mismatch, (*c*) and about half the children read word by word and might therefore be able to respond to a speech-vision mismatch as a cue to error having occurred.

TABLE 2

READING BEHAVIOUR AT THE BOOK READING STAGE REPORTED FOR THE MEDIAN CASE OF EACH QUARTILE GROUP OF 25 CHILDREN.

Quartile Progress Groups	Book-Reading Stage			
	No. of words tallied	Error rate	Self-correction rate	Weeks in book-reading stage
H	2599	37·29	2·75	19
HM	1605	15·20	3·81	14
LM	861	7·86	8·35	9
L	114	2·58	19·72	3

] Linked quartile groups were significantly different from each other *and* all higher or lower groups at ·01 level (Mann-Whitney U-tests).

Error-correction in the book reading stage.

(1) There were large differences between progress groups in the amount of reading during the first year at school, each higher progress group being significantly different from each lower group at the ·01 level (Table 2).

(2) 10,525 errors were made on the basic reading books. The rates at which children made errors were significantly different for all progress groups at the ·01 level. The median H group child made one error in every 37·39 words read, compared with the median child of the L group who made one error in every 2·58 words read.

(3) Spontaneous self-correction of 26 per cent of these errors occurred. The H and HM groups corrected one in every three or four errors and were significantly different in this behaviour from the LM and L groups where self-correction rates were one in eight and one in 20, respectively.

(4) In a linguistic analysis of substitution errors (7,683 errors) self-correction rates for groups were: L 11 per cent, LM 14 per cent, HM 28 per cent and H 35 per cent (Clay, 1968).

(5) The relationship between error rates and self-correction rates is represented diagrammatically in Figure 1, plotted for the median case of each progress group, and an interpretation of the reading behaviour is made in the second half of that figure. The low error high self-correction of the H group is thought to result from efficient processing of cues. The higher error high self-correction of the HM group indicates that efforts are being made to relate cues and resolve inconsistencies but that this process does not operate in an efficient manner. The self-correction rates of the LM group indicate attempts to process cues but because there are so many error responses correct processing presumably meets with little positive reinforcement. The L group have high error, little self-correction, and fewer responses than the next higher group. Their response pattern has been characterised as low in effort.

(6) One category of error substitution may prove sensitive for revealing reading strategies. The *said Mother* and the *Mother said* sequence of words (and similar sequences of the same construction) occurred frequently in the reading books. Self-correction rates for this construction were very high for the two top groups (62 per cent and 53 per cent) and extremely low for the two bottom groups (6 per cent and 9 per cent). An interpretation of this difference could be that the high groups predicted the occurrence of the construction and were checking at the word or letter level for cues that would confirm whether the words *said* and *Mother* occurred, and in which order. The low progress groups were using the construction as a whole, fitting it into a slot within the sentence without attending to word or letter units, or to word or letter order.

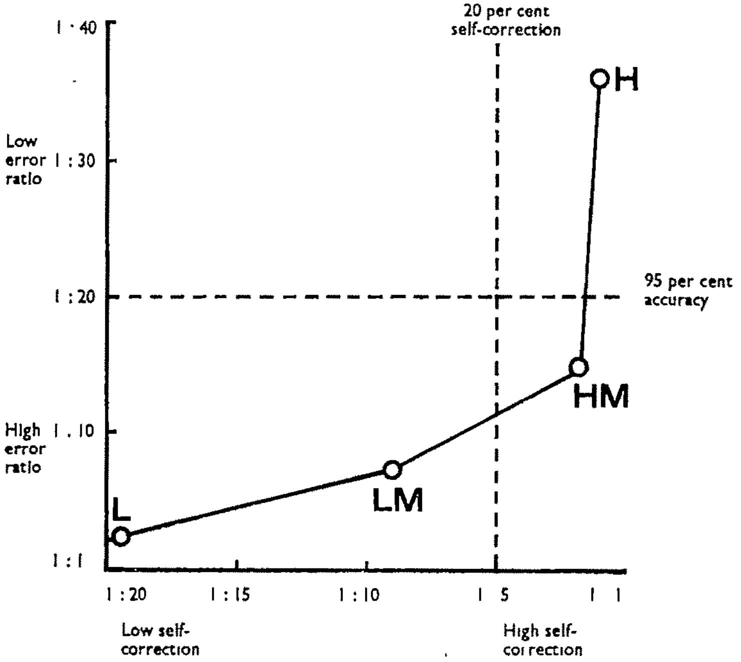
Error-correction and the linguistic analysis of error.

A linguistic analysis of the errors is reported elsewhere (Clay, 1968) but three points are particularly relevant in examining the nature of self-correction behaviour.

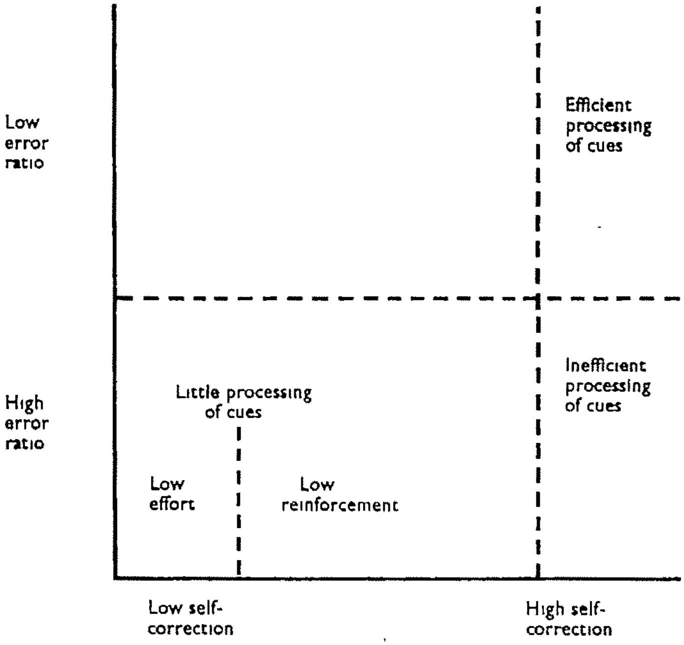
(1) Beginning readers substituted words which were syntactically appropriate for the sentences they were reading in 72 per cent of all substitution errors and gave responses that were similar in some aspect of letter-sound relationship in only 43 per cent of the errors. It is clear from this that grammatical competence would be a significant source of cues for an error-correction strategy.

FIGURE 1

ERROR AND SELF-CORRECTION RATIOS: MEDIAN CASE OF EACH QUARTILE GROUP. (Error ratio reads: 1 error in every X running words. Self-correction ratio reads: 1 self-correction in every X errors.)



INTERPRETATION OF READING BEHAVIOUR:



(2) Verbs which were substituted in error for other verbs agreed with the text in *both* number and tense in 55 per cent of the occurrences (which is very different from chance in a 2×2 table), implying some response to contextual constraints.

(3) Nouns had very low rates of self-correction (20 per cent) compared with the higher rates for pronouns (60 per cent) which have to agree with some referent close at hand.

These examples support a view that the child is able to respond to dissonance or consonance in the grammatical and semantic aspects of his language behaviour.

Statistical analysis of error-correction behaviour.

The scores of the Reading Progress Test were normalized but the error and self-correction variables were curvilinear in distribution. Rank correlations and Eta coefficients for the total group, and Eta coefficients for a reduced sample (82 children for whom there were behaviour samples of more than 120 responses) were calculated and an attempt was made to construct a three dimensional model of changes in error-rate, self-correction rate and reading progress. The interpretations of Figure 1 are not contradicted by any of these analyses although error rate always shows a higher relationship to reading progress. The interpretations of Figure 1 are not contradicted by any of these a certain level of correct responding has been reached, and it may lose significance for high progress readers whose ' processing ' may become covert and prior to responding, rather than overt and subsequent to the first response.

The Eta coefficients for the N=82 group were 0·75 (error rate x reading score), 0·63 (self-correction rate x reading score) and 0·58 (error rate x self-correction rate).

IV.—DISCUSSION.

A reader may become conscious of a difference between what he has said and one of the several messages from the text, and experience feelings of dissonance (Festinger, 1958).

(*a*) The response may not make sense—in the sentence, in the story, or with the pictures. This creates cognitive dissonance.

(*b*) The response may make sense but something in the print may be incongruous with the response given. This creates perceptual dissonance.

In the first case a child may read, " Dad, let me paint you," and exclaim, " Hey ! you can't paint YOU ! " In the second case the child may read, " Mother said " for " Mother asked " and then protest, " It hasn't got the same letters as ' said ' " (visual imagery), or " But it starts with an ' a ' ! " (letter-sound awareness). Berlyne (1960) suggests that a dissonant relation can exist between cognitive elements and an overt action that the subject has already executed or is contemplating. This type of dissonance might be expected in early reading behaviour. The young child who learned in his pre-school world to recognise objects from a variety of angles, must learn to approach lines of print consistently from left to right. Movement across a line, and the finger pointing that supports it, are action sequences involved in the beginning reading process. Another action sequence consists of the speech impulses emitted as the child invents or reads a text. Somehow the word unit must be isolated from the flow of speech and matched to a word pattern located in the text, resulting in a sequential co-ordinating of visual locating and speech impulses.

A: Self-correction, appearing before children were promoted to their basic reading books, was first seen when the number of locating movements of hand and/or eyes did not match with the number of speech impulses emitted. This forced the child to consider alternative ways of expressing his ideas. B: Following this primitive need to choose between alternatives the child must develop an awareness that the precise identity of a word allows for no difference between *what makes sense* and *what is said*. This can be checked from grammatical and semantic cues which are available from oral language experience. C: After the child can co-ordinate his speech and locating behaviour he may learn to visually check whether the word he is looking at really is the word he predicted would occur but visual discrimination learning appears to take place slowly during this first year. D: In time, a smooth predict and check procedure may be established operating at the level of word groups but the competent reader would be able to descend to any level of detailed check, if the need arose, to resolve a conflict.

The child who co-ordinates cues from action, visual and language sources and who has an awareness that identity consists of agreement in all details, has developed a way of learning from his errors. As he searches and checks, more and more detail in the print attracts his attention, and he is possibly sensitized to more of the inter-relationships in language which provide cues and checks. Even H group readers made many errors which gave them plenty of opportunity to develop search and check procedures. But these errors were surrounded with large quantities of correct responding, and the long stretches of context with a full measure of syntactic, semantic, and story sequence cues provided a detailed background to the error when it occurred. The children therefore became progressively better at self-correction. It has been recognised that the proportion of error in reading is important and authorities recommend choosing books which allow the child to read with 95 per cent. accuracy. A higher error rate apparently blurs the matrix of cues to a greater or less extent so that instead of error behaviour generating more insights with a progressive gain in skill the activity becomes non-progressive, and the child becomes more confused as the vocabulary load increases.

Will the L progress group arrive at some later point in time at the position of the HM or H group? Are they merely slower to start? Because the data of this research were pooled observations over the period of one year this question cannot be answered. Two other possibilities could be suggested. While the H progress children were building adequate images and veridical discrimination nets, the L group were not idle. They were responding with inadequate images and were possibly building erroneous discrimination nets. What research has yet to tell us is whether such initial confusion is a barrier to subsequent efficient processing of cues in reading, or whether, because of some transactional quality, the experiences are stored in such unstructured form that they present no barrier to later veridical learning. Perhaps among the slow starters we might expect to find both the confused-and-blocked child and the unprogrammed-and-free-to-start-again type of child.

The ability to relate information from different sources may favour children of high intelligence and strategies dependent on visual or auditory memory may prove better for children of average intelligence or below. There is no clear answer to this question in these data. The H and HM group are distinguished on progress but have almost identical distributions for intelligence (median IQ 122), while the same is true of the L and LM groups (median IQs 106 and 108). There is a significant difference between the two top groups and the two lower groups on self-correction behaviour, however, which does coincide with a difference in median IQ. *Motor, perceptual and language differences would perhaps be of greater significance than general intelligence.* For example, if the co-ordination of motor and speech responses or of speech and visual behaviour is blocked by immaturity of intersensory pathways (Birch and Lefford, 1966), the advantage of the motor-speech mismatch orienting the beginning reader to choose between alternatives may be lost. If what the child says fails to coincide with what he sees most of the time, his responding must remain confused, approximate and non-progressive. Similarly, children with a poor command of the English language would have difficulty in predicting the constructions likely to occur, in remembering the sequences which do in fact occur, and in noticing the redundant cues which signal that errors have occurred. There is good reason to believe that the very complexity that provides rich cue sources for the child who is able to discover the regularities of the code may present confusion to the child of limited language skill.

Information processing would be given greatest scope if the method of teaching reading (*a*) allowed the child's spontaneous speech to be easily directed to the task, (*b*) stressed flexible and varied word-solving techniques, and (*c*) encouraged the children to work at their errors. The interpretations in Figure 1 would suggest that when there is little reading skill, teaching effort must be directed to stimulating interest which will produce a high level of responding. Then, until the child has discovered some regularities in print close observation and regular appropriate reinforcement of tentative responses would be necessary. As the information processing gained in strength the reinforcement would come from the task itself as dissonance was resolved. Behind the group making high progress was the HM group whose predictions were not sufficiently accurate and who needed specific instruction to raise the occurrence of correct categorizing of responses.

With regard to reading texts there is a critical distinction between claims that the most readily distinguished signals (*a*) differ in many respects, or (*b*) differ in only one attribute. Words in sentence structures which mirror the syntactic and semantic forms of the language which the child speaks fluently will increase the child's opportunities to detect errors and develop error-correcting strategies.

However simple the text any learning process which is as complex as reading, presents opportunities for missing links, weak links, devious routes where more facilitating ones could be taken, and contrasts between high skill which the child prefers to use and weak skills which he tries to avoid. There is scope in reading for much error-behaviour and a good defence against this would be strong error-correcting strategies applied to texts rich in cue sources. That these strategies could be developed by the young child still in a stage of intuitive rather than logical thinking seems best explained in terms of Neisser's concept of multiple thought processes which he considers particularly appropriate for dealing with novel, irregular stimuli too complex for logical sequential thinking. It was one of the observations in the original research report that as children responded they gradually became aware of what they were doing. This would suggest that by responding intuitively to complex and irregular stimuli the children gradually become aware of some of the dimensions of those stimuli and perhaps become able to employ sequential analysis at a conscious level.

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CORRELATES OF SCHOOL ATTAINMENT AT DIFFERENT ABILITY LEVELS

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SUMMARY. Correlations between school attainment and various intellectual, personality and social variables are reported separately for the top and bottom thirds of the ability range. The ability groups were formed from an age-group of 2,538 Aberdeen children, who had been given tests yearly between the ages of 11 and 14. Results suggest that secondary school attainment is more difficult to predict in the high ability group than in the low ability group. But academic motivation is more closely related to school attainment for the high ability group. Among bright boys extraversion is negatively related to attainment, but in the low ability group the relationship is positive. Similar, but less extreme, differences exist among girls in this sample.

I.—INTRODUCTION.

CORRELATIONAL analysis is based on the assumption that the relationship being investigated is linear and homoscedastic. This implies that the relationship will be constant at all values of both variables. While investigations are limited to cognitive variables, such as school attainment or verbal reasoning ability, these assumptions can generally be justified. But many recent studies report correlational analyses between school attainment and non-intellectual variables such as social background or personality. In such studies the assumptions of linearity and homoscedasticity may not hold. For example Entwistle and Cunningham (1968) have shown distinct non-linearity in the relationship between extraversion and school attainment. The U-shaped relationship found in this study was attributable partly to a sex difference in the direction of this relationship, but the relationship for each sex separately was still non-linear. Thus relationships may alter as the value of one of the variables changes and there may also be different relationships holding within sub-groups of the population tested.

Swift (1967) has also demonstrated both of these effects. He showed, for example, that the relationship between family size and 11+ success was closer among working-class children than among middle-class children. Nisbet and Entwistle (1967) reported a similar result in which the regression coefficient of intelligence test score on family size was lower for social classes I and II of the Registrar-General's Scale than for the other social classes. Swift (1967) also gave examples in which restricting the range of one variable has led to an increased value of the correlation coefficient calculated. Swift saw this as an indication that different relationships exist among different sub-groups.

Wiseman (1967) has offered an alternative explanation. Previously it has been assumed that restricting the range of one or both variables will inevitably lower the computed value of the correlation coefficient. Wiseman suggests that this may not necessarily be true for all types of variable. He also gives additional examples in which the correlation coefficients from sub-groups differ substantially in both magnitude and direction from those derived from the complete sample. Also in restricting the range of some non-intellectual variables there are increases in the correlation coefficients, but these are accompanied by a lack of homoscedasticity. The correlation grids for these relationships tend to be triangular instead of elliptical. This does not rule out the possibility of real differences in relationships being behind the distorted correlation grids. In fact, such an explanation seems more likely than the possibility of a statistical artefact, previously unsuspected.

The intriguing possibility of different relationships at different ability level led to the present analysis. In Aberdeen, a recent follow-up study investigated the age of transfer and the transition to secondary education (Entwistle 1967, Nisbet and Entwistle 1966). This study also provided data to investigate the possibilities suggested by Swift (1967) and Wiseman (1967).

II.—THE PRESENT STUDY.

The sample consisted of an age-group of 2,538 Aberdeen school children, who had been tested on various occasions between the ages of 10 and 14 years. The measures used in the present analysis are detailed below.

At age 14—Teachers' marks from all academic subjects were averaged and scaled by classes against the Moray House Advanced Verbal Reasoning Test 12, using the method described by Yates and Pidgeon (1957, page 88).

At age 13—(*a*) Junior Eysenck Personality Inventory; (*b*) Academic Motivation Inventory (Entwistle, 1968).

At age 12—Moray House Verbal Reasoning Test 72.

At age 11—N.F.E.R. Non-verbal Reasoning Test 1.

At age 10—Socio-economic rating derived from the Registrar-General's Scale of Occupations as follows:

(1) Professional occupations.
(2) Semi-professional and managerial.
(3) Clerical and skilled non-manual.
(4) Highly skilled manual.
(5) Skilled manual.
(6) Semi-skilled manual.
(7) Unskilled manual.

(The approximately normal distribution of pupils over this scale suggested that correlational analysis was appropriate for this variable.)

III.—RESULTS.

(i) *Complete ability range.*

The data for boys and girls were analysed separately to identify possible sex differences in the relationships. The correlations between school attainment at age 14 and the other variables are shown in Table 1. There is a suggestion that the secondary school attainment of girls can be predicted more accurately from reasoning tests in the primary school than that of boys, but these differences are not statistically significant. The sex difference in the correlation between academic motivation and attainment only just fails to be statistically significant ($t=1{\cdot}86$). Such a sex difference might reflect the choice of items in the inventory and the lower standard deviation in the girls' scores, but there is still a possibility that some of the relationships between attainment and personality variables show sex differences. This was shown to be true of the extraversion dimension in a previous study of the attainment of these pupils after one year in secondary school (Entwistle and Cunningham, 1968). In the present study the same difference is found. Introverted boys but extraverted girls tend to be more successful in class than their peers of the opposite personality type, although this difference, after two years in secondary school, could have occurred by chance.

TABLE 1

CORRELATIONS OF ATTAINMENT AT AGE 14 WITH OTHER VARIABLES.

Variable	Age	Boys N=1,293	Girls N=1,245
Verbal Reasoning	12	·834	·845
Non-Verbal Reasoning	11	·664	·696
Extraversion	13	—·012	·048
Neuroticism	13	—·150	—·198
Academic Motivation	13	·480	·428
Socio-economic Rating	10	·323	·325

The correlations between attainment and socio-economic rating show no sex differences, but there is the expected positive relationship between high social class and school attainment.

(ii) *Sub-groups at different ability levels.*

These ability groups were formed from scores on the teachers' estimates of attainment at age 14. After scaling, these estimates were in the form of quotients which had been restandardised on this Aberdeen age-group to produce approximately a mean of 100 and a standard deviation of 15. The high ability group contained pupils having attainment scores of 110 or above; the low ability group had scores of 89 or below. The means and the standard deviations of the sub-groups on each measure are shown in Tables 2 and 3, again keeping the analysis separate for boys and girls. The correlation coefficients computed for each ability group of boys and girls, compared with the complete ability range, are shown in Table 4.

TABLE 2

MEANS AND STANDARD DEVIATIONS FOR COMPLETE ABILITY RANGE AND FOR SUBGROUPS WITH DIFFERENT ABILITY LEVELS (BOYS ONLY).

Variable	Age	Complete Ability Range N=1,293	High Ability Group N=327	Low Ability Group N=285
		Mean (σ)	Mean (σ)	Mean (σ)
Attainment	14	100·2 (13·69)	118·0 (6·39)	82·0 (6·02)
Verbal Reasoning	12	100·7 (13·65)	115·6 (9·05)	85·2 (8·52)
Non-verbal Reasoning	11	101·3 (13·99)	113·5 (10·62)	88·6 (11·53)
Extraversion	13	17·9 (3·76)	17·5 (4·14)	17·8 (3·68)
Neuroticism	13	11·9 (4·76)	10·9 (4·49)	12·7 (4·86)
Academic Motivation	13	15·6 (4·54)	18·7 (3·15)	12·7 (4·27)
Socio-economic Rating	10	4·3 (1·57)	3·5 (1·54)	4·9 (1·44)

TABLE 3

MEANS AND STANDARD DEVIATIONS FOR COMPLETE ABILITY RANGE AND FOR SUB-GROUPS WITH DIFFERENT ABILITY LEVELS (GIRLS ONLY).

Variable	Age	Complete Ability Range N=1,245	High Ability Group N=319	Low Ability Group N=291
		Mean (σ)	Mean (σ)	Mean (σ)
Attainment	14	100·2 (14·41)	119·1 (6·80)	81·6 (5·57)
Verbal Reasoning	12	100·4 (13·52)	115·3 (9·68)	85·2 (7·54)
Non-verbal Reasoning	11	101·0 (14·25)	113·3 (10·35)	86·5 (10·77)
Extraversion	13	17·2 (3·62)	16·9 (3 92)	16·6 (3·37)
Neuroticism	13	12·9 (4·71)	11·5 (4·65)	13·9 (4·23)
Academic Motivation	13	16·7 (3·91)	18·9 (3·21)	14·6 (3·68)
Socio-economic Rating	10	4·5 (1·60)	3·7 (1·51)	5·1 (1·44)

TABLE 4

CORRELATIONS OF ATTAINMENT AT AGE 14 WITH OTHER VARIABLES FOR DIFFERENT ABILITY GROUPS COMPARED WITH THE COMPLETE ABILITY RANGE.

Variable	Age	BOYS			GIRLS		
		Complete Ability Range N=1,293	High Ability N=327	Low Ability N=285	Complete Ability Range N=1,245	High Ability N=319	Low Ability N=291
Verbal Reasoning	12	·834	·434	·592	·845	·515	·557
Non-verbal Reasoning	11	·664	·220	·446	·696	·286	·345
Extraversion	13	—·012	—·102	·174	·048	·036	·205
Neuroticism	13	—·150	—·040	—·065	—·198	—·112	·006
Academic Motivation	13	·480	·137	·064	·428	·239	·042
Socio-economic Rating	10	·323	·159	·034	·325	·154	·114

Comparing the standard deviations in Tables 2 and 3 with the correlations in Table 4, most of the variables show the usual reduction in correlation for the homogeneous groups. The exceptions are the extraversion and neuroticism dimensions where the ability groups show unexpected changes in the direction of the relationships. Excluding the Eysenck scales, it seemed appropriate to apply the Pearson formula* to facilitate comparison with the values obtained for the whole sample. Where the corrected values have been obtained from near zero correlations, however, these must be interpreted with caution. Table 5 shows the values of the correlations after correction for homogeneity. The pattern of results suggests that this process was justified. For the two reasoning tests and the academic motivation inventory correlations in Tables 4 and 5 show

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* $R_{12} = r_{12}.\ p_1 p_2 + q_1 q_2$ (where $p_1 = \frac{s_1}{S_1}$; $q_1 = \sqrt{1 - q_1^2}$ and p_2 and q_2 are similarly defined).

TABLE 5

Correlations of Attainment at Age 14 with Other Variables for Different Ability Grous Adjusted for the Effects of Homogeneity in Both Variables.

Variable	Age	Boys			Girls		
		Complete Ability Range N=1293	High Ability N=327	Low Ability N=285	Complete Ability Range N=1,245	High Ability N=319	Low Ability N=291
Verbal Reasoning..	12	·834	·796	·864	·845	·790	·886
Non-verbal Reasoning	11	·664	·654	·670	·696	·704	·705
Academic Motivation	13	·480	·681	·362	·428	·596	·327
Socio-economic Rating	10	·323	·245	·423	·325	·360	·442

similar differences between high ability and low ability groups. The correlation between verbal reasoning and attainment is higher for the low ability group of both boys and girls. Each of these differences, taken separately, could have occurred by chance, but the close similarity in the correlation values for both boys and girls increases the probability of this being a significant finding.

The largest difference between the ability groups is on the academic motivation inventory. The correlation with position in class is significantly higher $(p < \cdot 001)$ for the high ability groups of both sexes. This may again result from the choice of the items in this inventory; some of these may not have been meaningful to low ability children. A recent item analysis of this inventory (Nisbet, 1968) has shown some evidence of this. But any measure which correlates with attainment in a group of high ability children is potentially of value. Predicting academic success is particularly difficult for such pupils, especially as they become older.

The results for the correlation between attainment and socio-economic rating in Tables 4 and 5 contain distinct differences. In Table 4 the high correlation is shown by the high ability groups, both boys and girls. This result is reversed in Table 5 after correcting for homogeneity, but part of this change may be a statistical artefact. While it seems reasonable to correct for homogeneity in ability, the homogeneity in the socio-economic rating at the different ability levels reflects the situation in the overall population. Correcting for homogeneity only on the attainment variable produces the same pattern of results as shown in Table 4. The tentative conclusion from this discussion would be that the correlation between social class and attainment is higher among the bright children. Such a conclusion would also fit into previous findings. Murdoch (1966), for example, found that children from middle-class homes adjust more easily to selective secondary schools in Aberdeen than children from working-class homes.

The most intriguing result emerging from the whole analysis appears in the extraversion dimension in Table 4. The sex difference is still apparent, with introverted boys and extraverted girls doing slightly better in class. At this stage another complication arises. Among boys there is yet another change in the direction of this relationship. High ability introverted boys but low ability extraverted boys tend to show higher attainment than their classmates, with the opposite personalities but equivalent abilities. This difference is highly significant ($p < \cdot 001$).

The girls show a similar, though less extreme difference ($p < \cdot 05$). Apparently for bright girls, extraversion or introversion is irrelevant; both types are almost equally likely to do well in class. On the other hand, extraverted girls in the low ability group show a distinct tendency to have comparatively high teachers' estimates.

IV.—DISCUSSION.

The finding that it is easier to predict continued low attainment than high attainment in secondary school must confirm the opinions of many teachers. Certainly this conclusion would come as no surprise to the proponents of the comprehensive system who have often maintained that the low attainment of 11+ ' failures ' is inevitable after selection. Vernon (1957) also pointed out the self-fulfilling prediction of the 11+ procedures, but the greater accuracy in predicting success or continued low attainment among children of low ability has rarely been considered in the research literature.

The converse of this finding is familiar. It is more difficult to predict the later academic success of pupils among the top 25 per cent of the age-group. Certainly prediction becomes increasingly difficult as selection becomes more rigorous and this is not just a result of increased homogeneity. Beyond a certain intellectual level non-intellectual factors appear to play an increasingly important part in academic success. In this study the comparatively high correlation between academic motivation and teachers' estimates in both high ability groups reinforces this conclusion.

The unexpected complications in the relationships between extraversion and achievement again point to the importance of using strictly representative samples. These also reinforce Wiseman's (1967) warning about calculating correlations at different ability levels. In the present study the relationships differed between boys and girls and also between the two ability groups. It is difficult to put forward any convincing explanation of why extraversion correlates negatively with school success for bright children, but positively among children with attainment quotients of less than 90. As the high ability group coincides closely with those who were allocated to selective secondary schools, it is tempting to suggest that this difference in schools lies behind the different relationships. The traditional academic approach of the grammar or senior secondary school might well be expected to favour the introvert. The effect is less marked for girls, but a possible explanation of this sex difference has already been discussed (Entwistle and Cunningham, 1968).

The advantage of the introvert in school has also been mentioned by Eysenck (1965). The build-up of reactive inhibition is delayed in the introvert, thus facilitating prolonged study. Eysenck has not suggested, as yet, a sex difference in the effect of this reactive inhibition, which might explain the greater success of extraverted girls.

The negative effects of high extraversion on attainment in selective secondary schools may also be responsible for our findings. The extraverted boys, in particular, may become too interested in the many opportunities for out-of-school activities. They are also more likely to indulge in aggressively disruptive behaviour in class. Such behaviour would almost inevitably lead to poor school attainment. The behaviour of extraverted girls may well be more social and less aggressive than that of the boys and so they avoid academic deterioration.

There remains another alternative explanation of the different relationships between extraversion and attainment at the different ability levels. In the manual of the JEPI (S. Eysenck, 1966), correlations between extraversion and intelligence are shown at different ages. The samples used were rather small, but there was a tendency for the correlations to change from positive for 11-year-olds to negative for 15-year-olds. Behind this may be a change in the direction of the relationships at different mental ages. This would fit in with the results found in the present study for children of the same chronological age but at different ability levels or with different mental ages.

The results of this study can do no more than provoke speculations and further investigations. Further correlational analysis of the relationships between school attainment and both personality and social variables by sex and at different ability levels should provide additional questions to whet the appetite of both teachers and theorists.

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THE DEVELOPMENT OF SCALES TO MEASURE JUNIOR SCHOOL CHILDREN'S ATTITUDES

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SUMMARY. This paper describes ten attitude scales for use with pupils aged 9 to 11 years. These are: attitude to school; interest in school work; importance of doing well; attitude to class; 'other' image of class; conforming *versus* non-conforming pupil; relationship with teacher; anxiety about school work; social adjustment; self-image.

The scales were derived empirically and each is made up of a number of statements made by children during group discussions and selected after factor analyses and scalogram analyses. For each scale the aim has been to achieve homogeneity of content and where possible a cumulative structure. The internal consistency of each scale is expressed in terms of Cronbach's alpha coefficient. The intercorrelations of the scales with each other and also with external data are given. Information for the latter came from several sources. These were (*a*) personality and ability ratings of the pupil by the teacher; (*b*) parents' ability ratings and educational aspirations for the child; (*c*) sociometric data; (*d*) achievement test scores; and (*e*) interest scores.

I.—INTRODUCTION.

A LARGE scale research study was initiated in 1963 by the National Foundation for Educational Research to investigate the effects of streaming and non-streaming in junior schools (Barker Lunn, 1967). Measurement of pupils' attitudes was particularly important and since no measures meeting the requirements of the study were available, attitude scales were developed. The construction and relationship of these scales to other variables are described in this paper. Other research workers may find them of use; for besides meeting the requirements of the streaming research project, these empirically derived scales offer a means of measuring and describing important attitudinal differences among groups of children in junior schools.

Since little was known about which attitudes were important and relevant for the enquiry, exploratory work in the form of discussions and interviews was carried out. The aim here was to determine what attitudes children actually held and how these feelings were expressed. The exploratory work revealed a number of attitude areas which seemed important for this research. A review of the literature indicated that most of these areas had received little attention. There were scales available for four of them, namely, anxiety (Himmelweit and Petrie, 1951; Sarason, *et al*, 1960; Casteneda, *et al*, 1956), self image (Bills, *et al*, 1961), attitude to school (Fitt, 1956; Flanders, 1965; Jackson and Getzels 1959), and attitude to teacher (Tcheschtelin, *et al*, 1940), but none of these scales seemed suitable for the present enquiry. Some of them had been developed for use with older children and most were constructed for a non-British population. Thus a certain amount of item re-writing and adaptation would be required before they could be used in this country. It was considered necessary therefore to develop a total set of new scales for all areas.

The principle in the construction of the scales was to obtain the items from statements actually made by children for whom the scales were intended. To the writer's knowledge this method has not been used before with children, and indeed this might be levelled as a criticism against past work; most researchers in this field have not made clear how they derived their items and one can only assume that they were formulated at the desk out of the researcher's head. Such items are inevitably based on the researcher's own thinking, tend to be written in a language not used by the child, and worse still, cover a biased and artificial viewpoint representing the researcher's ideas about how children think than the way they actually do. Piaget's work has shown conclusively that the language and concepts of children are very different from those of adults. For this reason, discussions were held with children and their language used in the construction of the scales.

II.—PROCEDURE.

The stages involved in the development of the scales were (i) group discussions, (ii) quantitative pilot, (iii) factor analysis and (iv) a second stage of fieldwork to develop the scales further.

17 group discussions were held in 5 schools and involved approximately 60 third and fourth year junior school children of differing ability levels. The schools were located in London, the Home Counties, the Midlands and the North of England. The group discussions were carried out in a room where no disturbance by other children or members of staff was likely. In most cases the room was a spare classroom. The role of the leader of the group discussion was to steer the conversation to relevant topics, and to encourage development of certain ideas, but at the same time to appear permissive and unobtrusive. A schedule had been prepared beforehand and this was used as a rough guide. It covered the following areas: interests; attitudes to school, teacher, other classes, peers and self; ambitions; wishes. The group discussions were taped and later transcribed.

For the most part, attitudes were coherently formed and the children had no difficulty expressing them in a group situation.

The records of the group discussions yielded a wealth of data about children's values and attitudes and how they viewed school life. Content analysis indicated a number of areas (eight) crucial to a study of this type. One hundred statements were selected from the discussions to represent the range of opinion in each of these attitude areas. A questionnaire was drawn up and items were randomised throughout. After a preliminary screening, the questionnaire, containing 73 statements, was administered to 355 9 to 11-year-old children in 12 schools, 6 in the North and 6 in the South of England.

The resulting data were subjected to exploratory factor analysis. The main emphasis here was on the rotated solution. Following the intercorrelation of the items, a principal components factor analysis was obtained; 11 factors were extracted. These were rotated by the Varimax procedure to orthogonal simple structure. Seven interpretable factors were identified. By and large these confirmed the findings of the exploratory research. Although the factor analysis clarified the structure of the attitudes, it did not provide a completely satisfactory set of measuring instruments. Three of the attitude areas consisted of promising sub-sets of items (the average correlation of each set ranging from ·19 to ·28) but did not emerge as factors, apparently because the number of suitable items was inadequate. In order to develop instruments in all areas, a revised questionnaire was developed. The transcripts of the exploratory discussions were re-examined and statements which appeared to be related to these 'promising sub-sets' of items were selected. Advantage was also taken of the new questionnaire to improve the other seven areas and items with low loadings were rejected and replaced by other statements. A questionnaire, comprising 79 statements covering ten attitude areas, was developed and used. The attitude scales were constructed on the basis of the results of a second stage of fieldwork.

Approximately 2,300 third and fourth year junior school children, in 28 schools, completed the revised questionnaire. Based on the responses of 400 of the boys and girls, selected at random from the total sample, intercorrelations between the items hypothesized to form an attitude scale were obtained and those items with a low overall level of correlation were rejected. The remaining items for each attitude area were then submitted to scalogram analysis. If the usual Guttman method (Guttman, 1950) was unsatisfactory, the H-technique was tried (Stouffer, *et al*, 1952) and a modified type of Guttman scale was formed. The responses to items in three areas did not form a cumulative pattern and were therefore unsuitable for scalogram analysis ; so factor scales were formed. The procedure for this was to carry out a centroid analysis (Harman, 1967) of the inter-item correlations and the first two factors were extracted. And then in order to test whether the correlation matrix could be accounted for by one general factor a comparison of the size of the variance of these two factors was made. Vernon (1950) claims that a ratio of 4 to 1 (i.e., if the amount of variance explained by the first factor is four times as great as that explained by the second) is evidence of unidimensionality.

III.—RESULTS AND DISCUSSION.

Ten attitude scales, as listed in Table 1, were successfully constructed. These were found to be positively inter-correlated and their product moment correlations are given in Table 1. 36 of the obtained correlations were significant at ·05 or beyond indicating a degree of overlap.

It will also be noticed that the correlations fall rather neatly into two clusters. The first seven scales (A—G) deal with attitudes towards aspects of school and school work and the other four (G—J) are more concerned with social relations and the personality of the pupil. ' Relationship with teacher ' appears to correlate relatively highly with both clusters.

TABLE 1

INTERCORRELATION COEFFICIENTS OF THE CHILDREN'S ATTITUDE SCALES

Attitude Scale		A	B	C	D	E	F	G	H	I	J
Attitude to school	A	..	..	..	..	..	..	..	..	..	..
Interest in school work ..	B	·71	..	..	..	..	..	..	..	..	..
Importance of doing well.	C	·44	·45	..	..	..	..	..	..	..	..
Attitude to class	D	·40	·43	·36	..	..	..	..	..	..	..
' Other ' image of class...	E	·21	·23	·09	·25	..	..	..	..	..	..
Conforming *versus* non-conforming pupil	F	·37	·38	·37	·25	·14	..	..	..	..	..
Relationship with teacher	G	·39	·43	·36	·36	·20	·36	..	..	..	..
Anxiety (non-anxious *versus* anxious) about school work	H	·15	·16	·02	·01	·14	·09	·24	..	..	..
Social adjustment	I	·09	·13	·12	·12	·10	·00	·21	·23	..	..
Self Image	J	·20	·25	·26	·09	·09	·13	·42	·40	·29	..

A correlation of ·11 is significant at the ·05 level. N=2,087.

What do the Scales Mean?

In most cases the titles of the scales are self-explanatory. However, it is proposed to give a short description of each and note its relationship with other variables.

The *attitude to school* scale was made up of items concerned with general rather than specific aspects of school. For example, it included statements such as ' School is fun,' ' I would leave school tomorrow if I could ' and ' I like school.'

The *interest in school work* scale was composed of items concerned with both school work in general and particular lessons. An example of the former is ' I enjoy most school work ' and of the latter ' We spend too much time doing arithmetic.'

Importance of doing well was made up of items stressing achievement orientation—' I work and try very hard in school,' ' Doing well at school is most important to me.'

These first three scales exhibited a fairly high degree of inter-correlation, particularly ' attitude to school ' and ' interest in school work.' It should be pointed out that the latter two scales were ' forced,' for during factor analysis only one factor emerged in this area and not two. On inspection of the content, however, it was seen that the items fell into two groups—one dealing with general attitudes and the other with school work. Thus the two groups of items were dealt with separately when forming the two Guttman scales. (For the time being it was felt worthwhile preserving these as two scales, but the results so far show similar construct validity and therefore there is perhaps a case for combining them.)

Of particular interest are the significant positive intercorrelations of all the scales (except ' social adjustment ') with ' attitude to school ' and ' interest in school work,' which would seem to indicate the presence of a general factor. The relationships of the other scales with ' importance of doing well ' were also interesting : the child who wanted to do well in school tended to have a favourable attitude to school and school work, tended to be conforming and to have a good relationship with his teacher. There was no consistent tendency for this child to be either anxious or non-anxious.

One would expect some degree of relationship between school performance and attitude. Table 2 indicates that this is so, particularly for ' importance of doing well.' This scale correlated positively with the child's English score (·28) and other achievement test scores and also with the teacher's rating of the child's ability (·26). However for ' attitude to school ' and ' interest in school work,' the highest correlation was with creative interests (·32) and (·31) respectively. This is not surprising when one considers the content of the creative interests scale : it includes items such as ' writing stories,' ' making up poems,' ' acting,' ' playing musical instruments,' and ' painting,'—all activities which may form part of the curriculum. If the child liked doing these things he also tended to like school.

Another noteworthy finding was the relationship between the child's sex and attitude : for the above three scales, girls tended to have more positive attitudes. This finding agrees with those of other workers (Fitt, 1956 ; Fox, 1964 ; Sears, 1963).

The scale measuring ' *attitude to class* ' contained items referring to the favourableness or otherwise of being a member of a particular school class. For example, ' I'd rather be in my class than the others for my age,' and ' I hate being in the class I'm in now.' The emergence of these items as a factor, during the factor analysis, was particularly interesting—for what had actually been hypothesised did not occur. It was thought that the items now forming the ' social adjustment ' (or ' getting on well with classmates ') scale and items in *this* scale were ' part of the same package.' However, two factors and not one, as expected, were extracted from this set of statements.

TABLE 2

PRODUCT MOMENT CORRELATIONS OF ATTITUDE SCALES WITH OTHER VARIABLES.

Attitude Scale (Key in Table 1)	A	B	C	D	E	F	G	H	I	J
Scholastic Performance										
Achievement Tests :										
English	·20	·19	·28	·19	·18	·17	·22	·21	·25	·26
Problem Arithmetic	·15	·10	·20	·17	·11	*	·14	·20	·25	·33
Essays	·17	·15	·24	·18	·14	·13	·21	·11	·19	·23
Verbal Reasoning	·17	·15	·23	·16	·16	·14	·16	·20	·17	·25
Non-verbal Reasoning	·15	·15	·17	·15	·09	·09	·18	·17	·20	·27
Fluency	*	*	·15	*	*	*	·10	·10	·19	·19
Flexibility	*	·09	·17	·11	*	*	*	·13	·17	·17
Originality	*	*	·12	*	*	*	*	*	·16	·13
Ratings :										
Teacher's rating of ability	·23	·19	·26	·21	·12	·15	·24	·20	·28	·40
Parents' rating of ability	·19	·17	·21	·14	·14	*	·23	·19	·21	·37
Arithmetic ability relative to others in class	·21	·17	·23	·09	*	*	·23	·18	·16	·46
Reading ability relative to others in class	·13	·12	·17	*	*	·11	·13	·20	·18	·30
Sociometric Status	·13	·10	·14	·11	*	*	·12	*	·21	·14
Interests :										
Creative Interests	·32	·31	·16	·16	*	·15	*	*	*	*
Logical, Analytic Interests	*	*	*	*	*	·11	*	*	·19	·15
Parents :										
Aspirations for child's further education	·12	·09	·15	·17	*	·13	·19	·15	·16	·18
Proposed age for child leaving school	·12	·12	·16	·15	*	·14	·18	·16	·17	·14
Social class	*	·10	·14	·15	*	*	·16	·11	·11	·11
Behaviour Ratings :										
Pleasurability	·13	·14	·16	·17	*	·20	·23	·13	·10	·21
Fights	*	–·13	–·11	–·15	*	–·25	–·19	–·09	*	*
Social Withdrawal	–·10	*	*	*	*	*	–·12	*	–·11	*
Teased/Picked on	–·09	*	–·13	*	*	*	*	*	–·11	–·09
Sex—Boys versus Girls	·33	·25	·19	·20	·15	–·27	·15	*	–·16	–·12

Sample=2,087 9–11-year-old children. All correlations are significant and those greater than ·11 significant at the 1 per cent level.

* Correlations were not significant.

It can be seen from the correlation matrix that 'social adjustment' has a low correlation (·12) with the 'attitude to class' scale. Of all the scales the highest correlation for the 'attitude to class' scale was 'interest in school work' (·43). It also correlated well with 'attitude to school' (·40), 'importance of doing well' (·36) and 'relationship with the teacher' (·36). It was unrelated to 'anxiety' and 'self image.' Table 2 suggests that children who had a favourable attitude to their class also tended to obtain a high rating on ability (·21). Girls had a more favourable attitude to their class than boys (·20).

The '*other image*' scale was composed of items concerned with the way children felt that other classes in the school and teachers viewed the child's own class. For example, 'Other children make fun of my class' and 'Other children think we're clever in this class.' The fact that it was given to the pupils in non-streamed as well as streamed schools probably accounts for the lowish correlations in the matrix and Table 2. This now needs to be looked at in terms of the streamed children only.

'*Relationship with the teacher*' items emphasised the teacher's perceived degree of concern for the child rather than the child's liking for the teacher. Some of the items making up this scale were 'Teacher thinks I'm a troublemaker,' 'Teacher is interested in me,' 'Teacher is nice to me.' It has already been pointed out that this scale had relatively high correlations with both the school related attitudes and the personality type scales. The highest correlations were with 'interest in school work' and 'self image.' Table 2 also suggests that good school work is an important factor for a satisfactory relationship with the teacher, a finding reported also by Fox (1964) and Rosenfeld (1961) : there was a positive correlation with the teacher's rating of the child's ability (·24), with the parent's rating of the child's ability (·23), with the child's English achievement (·22) and essay score (·21) and with the teacher's judgment of the child's pleasurability (·23).

As the title might suggest the items constituting the scale '*conforming versus non-conforming pupil*' covered the range of these two opposing types of behaviour. For example, the scale included items such as 'I dislike children who are noisy in class,' 'When the teacher goes out of the room I play about,' 'I like people who get me into mischief.' The correlation matrix indicates that the conforming pupil also tended to like school (·37), school work (·38) and the teacher (·36) and believed that it was important to do well in school (·37). There was no relationship between this scale and social adjustment or anxiety. Table 2 indicates that children obtaining high marks on this scale (i.e., conformers) also tended to obtain a high pleasurable rating from the teacher (·20) and those scoring low marks (non-conformers) to obtain a high fighting rating (·25). 'Conformity' was associated with girls and non-conformity with boys (·27).

The '*anxiety*' scale (non-anxious *versus* anxious) was composed of items related to anxieties, fears and worries in the classroom. For example, 'I would feel afraid if I got my work wrong,' 'Children who can't do their school work feel ashamed,' 'I'm scared to ask my teacher for help.' The matrix shows that this scale correlated best with self-image (·40) : children who had a good self-image in terms of school work also tended not to feel anxious in the classroom. This ties in nicely with Table 2 where it can be seen that 'non-anxious' children were associated with high test marks (English (·21), Problem Arithmetic (·20), Verbal Reasoning (·20)) and 'anxious' children with low marks. (Warburton (1962), summarising work carried out in the United States on relationship between anxiety and attainment, concluded that anxiety is related to poor attainment.) Also the 'non-anxious' pupils tended to receive high ability ratings from their teacher (·20) and to hold a high position in their class (Reading position (·20), Arithmetic position (·18).) Interesting too was the complete lack of relationship of this scale with 'importance of doing well.'

The items making up the '*social adjustment*' scale were concerned with the child's ability to get on well with his classmates. It included such items as 'I have no one to play with at playtime,' 'I think the other children in my class like me.' This scale exhibited very low correlations (or no relationship) with the school and school work related attitudes. It was however positively correlated with 'non-anxiety' (·23), 'relationship with teacher' (·21) and highest of all with 'self-image' in terms of school work (·29). Table 2 indicates that 'socially well adjusted' was related to high ability ratings from teacher (·28) and parent (·21) and to high test scores: English (·25), Problem (·25). Children with a high sociometric status score (i.e., highly chosen by other members of the class) also tended to obtain a high socially adjusted score (·21). Boys obtained higher adjustment scores than girls (·16).

The content of the items in the '*self image*' scale reflected self in terms of school work. For example, 'I'm useless at school work,' 'I'm very good at sums,' 'My teacher thinks I'm clever.' Self-image seemed to depend some what on the child's relationship with the teacher (·42) and if he had a good 'self image' he also tended to be a 'non-anxious' pupil (·40). (Bledsoe (1964), using an adaptation of Bill's Index of Adjustment, found a significant negative correlation between self-concept and anxiety.) Table 2 also supports these findings. Those whom the teacher rated as pleasurable tended to be those with a good self image and similarly also those whom she rated high on ability (·40). The child's relative ability seemed to be an important factor for self-image, for the highest correlation was with position in the class in arithmetic (·46), whilst the correlation with reading ability was somewhat lower (·30). Presumably there was a higher correlation with the arithmetic position than with reading because there are more cues for the child to judge his relative ability in arithmetic through similar ability grouping, marks and tests. Table 2 suggests that girls tended to have a poorer self image than boys. Sears (1963) also found this.

Internal Consistency of the Scales.

The internal consistency of these scales was determined by Cronbach's (1951) Alpha-coefficient. For the Guttman scales, coefficients of reproducibility were also calculated (Guttman, 1950). In all cases, the Guttman scales were replicated satisfactorily on a further two samples of 100 and the reproducibility coefficients given below are based on the average obtained from three separate samples, drawn at random from the total set of pupils.

TABLE 3

INTERNAL CONSISTENCY OF THE SCALES.

	Attitude Scale		Coefficient of reproducibility	Alpha-coefficient
A.	Attitude to school	(6 items)	·95	·89
B.	Interest in school work	(6 items)	·95**	·88
C.	Importance of doing well	(5 items)	Factor scale*	·77
D.	Attitude to class	(8 items)	Factor scale*	·91
E.	'Other' image of class	(6 items)	·92	·69
F.	Conforming *versus* non-conforming pupil	(5 items)	·95**	·90
G.	Relationhip with teacher	(6 items)	·92**	·82
H.	Anxiety about school work	(7 items)	·94**	·80
I.	Social adjustment	(4 items)	·90	·58
J.	Self-image in terms of school work	(9 items)	Factor scale*	·88

* Guttman scale not obtained.

** Modified Guttman scale constructed by H-technique (Stouffer, *et al*, 1952).

IV.—IMPLICATIONS.

Other research workers may find the scales of use; for besides meeting the requirements of the streaming research project, these empirically derived scales offer a means of measuring and describing important attitudinal differences among groups of children in junior school. Some evidence has been given of their validity. But it is hoped to obtain more substantial evidence from further analyses of the sample of 2,000 pupils. The interactions of these attitudes with other factors will also be examined.

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CHILDREN'S ATTITUDES TOWARDS JUNIOR SCHOOL ACTIVITIES

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SUMMARY. Attitudes towards five curriculum activities amongst 438 children were examined in relation to sex, age and schooling differences. A Guttman scale developed for the study proved to be a reliable and effective instrument for such an investigation amongst young children. The results suggest that girls held more favourable attitudes than boys towards school activities, and that expressive activities are held in higher esteem than more reproductive skills. Differences are indicated between schools, showing that emphasis on particular activities in school tends to be associated with more favourable attitudes. It is further shown that older children hold less favourable attitudes towards school activities and a markedly low attitude towards literary activities in particular.

I.—INTRODUCTION.

SCHOOLS are concerned not only with cognitive development but also with the affective development of pupils (Krathwohl, 1964); yet, whilst many studies have been concerned with cognitive performance, research into affective variables at junior school level has been limited. Studies of the relationship between attitude and attainment have consistently revealed positive correlations, Jordan (1941) and Shakespeare (1937), for example, reporting coefficients from +0·21 to +0·33; the relationship has been shown to be differential, being closer in Mathematics than in English (Biggs, 1959). Baraheni (1962) and Arvidson (1956) support these findings, suggesting that the relationship might stem from factors such as effective teaching, favourable background and high ability acting together to foster high attainment and positive attitudes towards school activities. Further evidence (Wisenthal, 1965) indicates that sex and age are significant variables, girls and younger children holding more favourable attitudes than boys and older children, respectively. Wisenthal suggests that the less favourable attitudes of older junior school pupils might stem from their increasing awareness of their inability to gain high attainments and becoming progressively less favourably inclined towards activities offering limited achievement, this being aggravated by teaching procedures which employ external criteria and critical techniques rather than the more permissive individual approaches used with younger age groups. In a study of written English, Sharples (1966) reports that children hold less favourable attitudes at the end of the final junior school year than at its beginning, and that this trend is most pronounced amongst children making the greatest gains in attainment during the same period. If teachers accept affective goals, as Evans (1965) suggests, then it is important to examine more closely the tendency for junior schools pupil to hold increasingly less favourable attitudes towards school activities.

Techniques for effecting attitude change in school situations are crude and intuitive. Whilst general theories of attitude change have been developed (Kelman, 1961) these have not been systematically applied to schools. Junior schools often attempt to modify attitudes by stressing certain aspects of the curriculum, special emphasis on such activities as music, reading and ' modern ' mathematics being common examples of such curriculum pressure. These idiosyncratic characteristics often stem from the individual interests of staff or from the head teacher's policy, and frequently become institutionalised through the development of specialist facilities, equipment and staff positions (Blyth, 1965). Investigations suggest that, where schools attempt to develop particular skills and interests, appropriate teaching methods and supportive climates are important factors in the development of favourable attitudes (Baldwin, 1965; Moore, 1967).

Although present evidence is limited, it appears that age, sex and teaching methods are related to attitudes towards school activities. Previous studies have considered general attitudes towards school, but it is desirable that specific activities should be examined in relation to factors shown to be of general significance, and also in relation to the efforts of schools to foster good attitudes.

II.—PROCEDURE.

The hypothesis tested was that, among children aged 9 to 11 years, attitudes would differ significantly between age groups and between sexes, in that younger children and girls would express more favourable attitudes; and between activities, in that expressive and creative activities would be more highly esteemed than symbolic and reproductive activities. It was further hypothesized that attitudes would differ between schools, children viewing more favourably an activity especially fostered by their own school.

The measurement of attitudes among junior school children presents a number of problems. Established techniques require comparative judgments or scaling of a number of statements, or the selection of a limited number of responses from an array of finely graded items. Evidence suggests that young children are not able to respond effectively to such procedures (Sharples, 1966), the precision and nicety of the judgments involved being too fine for younger children. Whilst this problem is avoided by using teachers' estimates (Wisenthal, 1965), these have questionable reliability, particularly where a number of specific measures of individuals are required rather than general estimates of group trends. Guttman's (1941) scalogram technique is more promising as it produces instruments requiring simple direct responses to fewer than ten brief statements and requires no comparative or scaling judgments.

Following Edwards (1957), statements of attitudes towards school activities were collected from 150 children. Editing reduced the initial array to 47 direct statements of attitude towards mathematics, reading, writing stories, art and physical education. These statements formed a pilot instrument which was completed by 620 children indicating whether they 'felt the same' as each statement in respect of each of the five activites. Scalogram analysis of these responses yielded an eight-item scale which could be ordered in a unidimensional hierarchy of expression of attitude, the coefficient of reproducibility (C) being ·952 and minimal marginal reproducibility (MMR) being ·569. The items were as follows:

(1) I hate it.
(2) It is the worst thing we do in school.
(3) I can't stand it.
(4) It is all right sometimes.
(5) I think it is good.
(6) It is most enjoyable.
(7) It is good fun and I like it very much.
(8) I love it.

The instrument is completed by the pupils' indicating by a tick if they ' feel the same ' as the statement about a particular activity. Scoring is effected by noting the lowest numbered item accepted below item number 4, or the highest numbered item accepted above 4. Inspection will show that it is not possible to accept items on both sides of the ambivalent item. Thus the individual scores for attitude towards a particular activity range from 1 to 8.

The scale was completed for each of the five activities by 438 children drawn from four schools, there being 146 children at each age level 9, 10 and 11 years, and equal numbers of each sex in each age group. Random exclusion was used to reduce the initial sample to this symmetrical design. Schools were selected on the basis of curriculum ' bias ' in favour of particular activities, showing emphasis on Physical Education (A), Art (B), Mathematics (C), and Language (D). Whilst differing in curriculum emphasis the schools were similar in approach, being pupil-centred and stressing exploratory individual activities rather than mechanical performances and group standards.

The sampling structure facilitated a 2×3×5 factorial analysis of variance considering sex, age level and activity, with 73 responses in each cell. Schooling factors were examined by separate analyses of variance as it was not possible to equate school groups for inclusion in the factorial design; these analyses considered differences between schools in respect of each activity, and within schools in respect of the five activities.

III.—RESULTS.

The three way analysis of variance showed sex, age and activity each to be significant ($F < \cdot 01$ in each case). Neither first nor second order interactions yielded significant F ratios.

Table 1 shows the group means, girls and younger groups having the higher scores. The activities were roughly ordered in terms of favourability, Art being most highly esteemed, followed by Physical Education, Reading, Writing and Mathematics in that order. In each section of the table, the differences between means are all significant, except for the differences between age 9 and age 10, and between Art and Physical Education.

TABLE 1

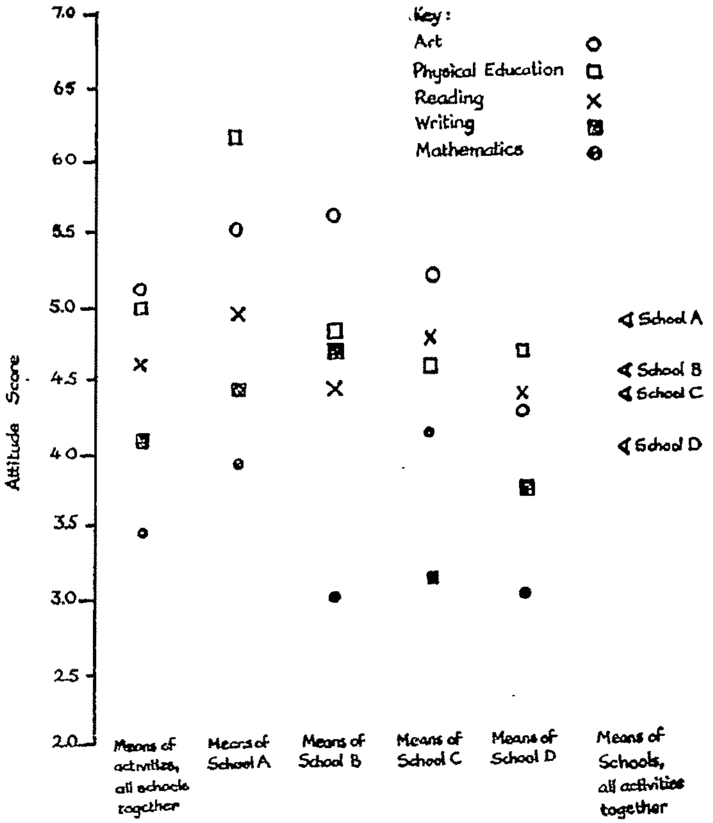
MEANS OF ATTITUDE SCORES OF SUB-GROUPS.

	Sex		Age			Activity				
	G	B	9	10	11	Art	P.E.	Read.	Writ.	Maths
Mean	4·60	4·35	4·68	4·74	4·00	5·18	5·03	4·60	4·15	3·41
N	219	219	146	146	146	438	438	438	438	438

The ten analyses considering schools and activities showed all F ratios to be significant at the 1 per cent level, but as the analyses involve 76 differences among 30 means the numerical data are somewhat confusing. Figure 1 presents the data diagrammatically, showing the relationships between means but omitting data of variance.

FIGURE 1

MEANS OF ATTITUDE SCORES, BY SCHOOLS AND BY ACTIVITIES.



IV.—DISCUSSION.

The results confirm the hypothesis that girls hold more favourable attitudes than boys in all activities at all three age levels. The absence of interaction between age, sex and activity suggests that general assumptions about 'girls' subjects' or 'boys' activities' are not well founded, although some junior schools still base the organisation of certain areas of work on such assumptions.

The more favourable attitudes of the younger as compared with the older children supports Wisenthal's (1965) results, although the suggestion that changes in teaching approach are related to this difference is not substantiated here. Attitudes amongst the older children were less favourable towards all activities, and whilst Mathematics and Writing may indeed become less child-centred there seems little basis for assuming that this is true for Art or Physical Education.

It has been suggested that 'pre-11+' pressure for high attainments is related to the emergence of less favourable attitudes. The schools in the present study were free from 11+ selection, being in a comprehensive system; furthermore, lower attitudes were found in relation to activities, such as Art, not subjected to 11+ pressure. It would appear that, whilst selection backwash might affect attitudes, in the absence of selection procedures there are other factors which adversely affect attitudes amongst older pupils. It is possible that these factors are related to different teaching techniques being employed with older classes, and with different expectancies of school activities amongst teachers and pupils at differing age levels.

The significant differences in attitudes towards the various activities were as hypothesized, the more creative and expressive activities being most favourably viewed. Thus Physical Education and Art were rated highly whilst Mathematics was consistently lowly rated ($p < \cdot 01$ in both cases). Reading was more highly esteemed than writing ($p < \cdot 05$), but this difference was less marked than that differentiating the literary activities from others.

It was hypothesized that attitudes would be favourable towards activities stressed in the school curriculum. The results support the hypothesis, Art, Mathematics and Physical Education being most highly favoured in those schools laying particular emphasis on those activities (although it should be noted that even in the school especially concerned with Mathematics this activity was not very highly esteemed). The results in relation to language are contrary to this trend however, pupils in school D, which emphasised literary activities, having significantly less favourable attitudes towards writing than two other schools ($p < \cdot 01$). There were only slight differences between schools in respect of attitudes towards reading, but here again school D had the lowest attitude score.

These results are disturbing, for School D, whilst attempting to sponsor development in language activities, is producing unfavourable attitudes towards the use of language. This result follows a previously noted trend (Sharples, 1966). It appears that there is a problem specific to literary activities at this level, where particular effort on the part of schools to improve pupils' performance is associated with the development of less favourable attitudes. In all other curriculum activities considered here special emphasis by the school was related to significantly more favourable attitudes.

The evidence of the present paper describes some aspects of the problem of attitudes amongst a small sample, and further studies are required to examine more fully the relationships discussed above. An analysis of those schooling experiences which apparently lead to improved attitudes in some activities might be valuable, perhaps leading to experimental literary activities designed to foster favourable attitudes amongst older Juniors.

ACKNOWLEDGEMENTS.—The author wishes to acknowledge the co-operation of the schools involved, and the generous assistance of Lena Bugeja, Jennifer Cullen, Nadia Learmond, Christine Moore and Brian Higgins.

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AN INVESTIGATION OF THE ATTITUDES OF ADOLESCENTS TO ASPECTS OF THEIR SCHOOLING

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SUMMARY. The attitudes of 192 boys and 192 girls aged 14-15 were examined concerning (1) their liking for school, (2) interest in subjects, (3) life goals and (4) personality development. Boys had a more favourable attitude than girls on points covered by (2) and (4); grammar school pupils had a more favourable attitude than the others on (2), (3) and (4). The results suggest that children's attitudes towards their schooling are by no means unitary.

I.—INTRODUCTION.

THE previous paper (Sharples, 1969) has reviewed the general field, and this paper is concerned only with two aspects. The influence of sex on attitude has been mentioned and an attempt is made to examine this variable. Also considered is the factor of type of school attended, in an attempt to clarify the relation between attitude and achievement in the school setting. The evidence (Allen, 1960) suggests that one would expect to find no difference in attitude towards school between girls and boys in the 14-year age group; however, one would expect to find a difference between the groups of grammar and secondary school children if one accepts the theory concerning the relation of attitude to achievement (Birney and Taylor, 1959) as children in these two types of school do undoubtedly differ in academic achievement.

II.—PLAN OF THE INVESTIGATION.

A total of 384 pupils aged 14–15 in their last year of compulsory school attendance were tested; 32 girls or 32 boys in each of six grammar and five secondary schools. With the exception of one secondary school all schools were single sex. The grammar schools, four State and two Roman Catholic Schools, were old established, serving a wide area in the same urban centres as the secondary schools. The secondary schools, three State and two Roman Catholic schools, were comparatively modern, intended to serve neighbouring housing estate developments. The subjects were selected by means of a table of random numbers from all the classes in the appropriate school year.

A Guttman attitude questionnaire was used, composed of four independent scales—liking for school; interest in specific subjects; education and life goals; and education and personality development. The Guttman method of scalogram analysis was used with the modification suggested by Edwards (1957). A selection of statements from books and individual opinions of both children and adults expressed during discussion and edited by the investigator, was then presented to a group of 20 judges, male and female, of various ages and economic backgrounds who placed each of the statements in one of the four categories of attitude to education, and any statement not placed in one category by at least 80 per cent of the judges was discarded. Remaining statements were examined to ensure that children could understand their meaning. Where necessary, words were simplified, but the statements retained virtually all their original form and meaning. Each sub-category contained approximately 12 statements at this stage.

A pre-test of the inventory was performed in order to establish that each of the scales satisfied the criterion of reproducibility and fulfilled the other requirements of satisfactory Guttman scales (1947). This pre-test was administered to a group of 100 secondary school children, similar in age and sex to the experimental group. The resulting scores were then examined by the scalogram board technique, and reproducibility of 89 per cent, 88 per cent, 90 per cent and 90 per cent was achieved on the four scales as detailed above. The frequency of response, that is, the cutting points where response for an item changes from one to another category, formed the required step pattern. The final scale contained 37 items (see Appendix). The Mann-Whitney test was used to determine whether significant differences existed between the various groups.

III.—Results.

The results in Table 1 show that there is no significant difference between the boys' and girls' responses to liking for school, and education and life goals.

TABLE 1

Mean Scores on the Four Attitude Scales.

Attitude Scales	Boys	Girls	Grammar pupils	Secondary pupils
Liking for school	5·78 (1·4)	5·76 (1·5)	5·72 (1·3)	5·83 (1·5)
Interest in subjects	7·86 (1·6)	7·48 (1·3)	8·02 (1·0)	7·33 (1·6)
Education and life goals	6·58 (1·4)	6·34 (1·5)	6·94 (1·2)	5·98 (1·5)
Education and personality development	6·03 (1·8)	5·55 (1·6)	5·91 (1·6)	5·67 (1·7)
N	192	192	192	192

(Standard deviations in brackets)

There was, however, a significant difference between these two groups in interest in specific subjects and personality development, the boys' attitude being more favourable than the girls ($p < \cdot 001$ in each case).

There is a significant difference between the grammar and secondary school groups for three of the attitude areas, the grammar school pupils having a more favourable attitude on the scales : interest in specific subjects ; education and life goals) ; and education and personality development ($p < \cdot 001$ in each case).

IV.—Discussion.

The variation in the favourability of attitudes between these groups brings to light the important point that children's attitudes towards their schooling are by no means unitary, and hence more useful information is provided if the general attitude towards school is sub-divided into more specific sub-attitudes. This theory appears to be substantiated by our results : for example, one group may have a favourable attitude on one scale and a less favourable attitude on another scale.

The comparison between the grammar and the secondary school children gives results consistent with other evidence ; for with the exception of the scale liking for school, the grammar school groups are significantly more favourable in their attitudes than are the secondary school groups. This is understandable when one considers the emphasis in grammar schools on the importance of academic qualifications for careers. Grammar school pupils, to a greater extent than secondary school children, tend to enter employment where academic qualifications are important as entry requirements. When this is not so, as is frequently the case with secondary school children, their schooling appears to have less bearing on their employment when they leave school.

ACKNOWLEDGEMENTS.—The author wishes to express his gratitude to the Londonderry and Salop Education Authorities, the various headmasters and headmistresses, and the school children without whose assistance this project could not have been realised.

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VI.—APPENDIX.

The statements included in the Questionnaire are listed in categories. The numbers indicate the actual order of the statements in the Questionnaire.

Liking for School.

(1) In some ways I like school.
(13) Learning is all right.
(9) I hate learning or studying of any kind.
(28) I get very bored and fed-up at school and do not really enjoy anything connected with it.
(17) We need some education in order to enjoy films, plays, sports and ballet.
(20) I like reading ' thrillers ' and playing games better than studying.
(5) I prefer comic papers, adventure magazines, and games, to studying.
(24) I think our schools are quite good enough as they are without trying to make them any better.
(30) I admit a slight dislike for school.
(36) I would perhaps like learning if school were more interesting.

Interest in Specific Subjects.

(6) I like some subjects at school.
(25) I am interested in at least one of the following : Science, French, Geography, Social Studies, History or English books, Art or Music or Practical Subjects.
(18) Even if I did not like school, I should still be interested in some of the actual subjects taught.
(37) There are not really any subjects we do at school that I like.
(2) I wish we could have more time at school for some subjects and less for others.
(34) I have to do a lot of subjects at school, all of which I dislike intensely.
(32) I hate most of the subjects I do at school.
(10) Out of all the subjects I learn at school there is only one I really like.
(21) School would be more interesting if the pupils were allowed to choose between either Maths. and Science subjects or English and Language subjects at an early age.
(14) In my free time I do not often read technical books but often read story books.

Education and Life Goals.

(22) Education may have some advantages, but on the whole it makes life more interesting and useful.
(11) Some education is useful to everybody.
(29) An educated person stands a better chance in the world than an uneducated one.
(19) I am not going to work too hard at school as I know plenty of people who have got quite good jobs without much education.
(26) I cannot understand girls and boys wanting to stay on at school after fifteen.
(7) Some people require education for their jobs, but for most of us it is rather a waste of time.
(15) There may be some good in education for some people, but not for everybody.
(3) Educated people get more out of life than uneducated ones.

Education and Personality Development.

(16) Girls and boys who stay on for a long time at school develop into nasty selfish characters.
(4) School teaches us to be good ' mixers.'
(27) If you have spent a lot of time at school you are more likely to do badly when difficulties appear.
(31) The longer one stays at school the less reliable one becomes.
(8) Girls and boys who stay on at school after fifteen become spiteful to those who leave school.
(35) Education helps us to develop good characters.
(12) Girls and boys who have a good education are nicer to know than those who don't.
(33) Girls and boys who have a good schooling are always thoughtful to others.
(23) Girls and boys who have a good schooling usually grow up to be kind.

RESEARCH NOTES

CROSS-CULTURAL USE OF THE PERCEPTUAL MAZE TEST

By GUSTAV JAHODA
(University of Strathclyde, Glasgow)

I.—Introduction.

The Perceptual Maze Test (PMT) devised by Elithorn (1955) differs from most measures of cognitive and perceptual functioning by its systematic, computer based structure. All the test items are homogeneous in character, consisting of target dots embedded in a lattice structure. The task of the subject is to find a path that goes through the maximum number of target dots (which number may or may not be specified). Instructions are simple, the two restrictions being that one must follow the chosen path and cannot cross over to another one, and that at each intersection only forward movement is permitted, without back-tracking. While the test was originally intended for the diagnosis of brain damage, it has come to be increasingly employed with normal populations (Beard, 1965 ; Davies, 1965).

At a recent international conference concerned with cross-cultural measures (1967), it was suggested that the PMT, with its basic simplicity of structure and ease of administration and scoring, would seem to have considerable potential for this purpose. In order to explore this possibility, it was decided to take advantage of a research project in Ghana and give the PMT to a group of subjects there. The aim of the present paper is to offer some preliminary findings and comments on the effectiveness of the test in such a situation.

II.—Subjects and procedures.

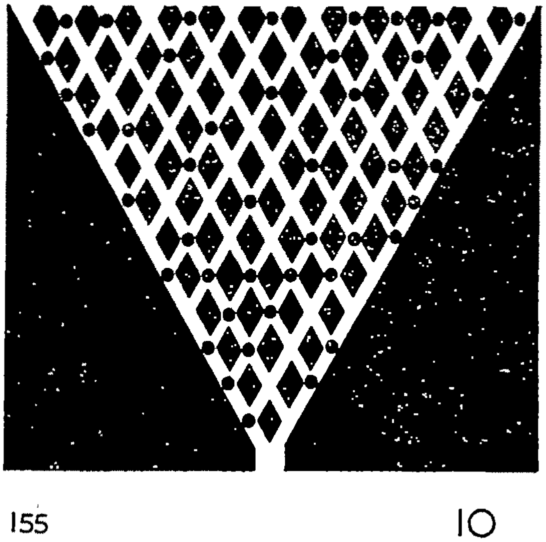
The subjects were 280 male students at the University of Ghana, drawn from the faculties of arts, social studies and science. A sub-sample of 66 students were also given the Block Design sub-tests of the Wechsler-Bellevue Scale and the short form of the Embedded Figures Test (EFT).

Some difficulty was encountered in the selection of a suitable version of the PMT. Two different group versions for adults (rectangular and triangular) exist, for which normative data are available. However, since West African students are not as test-sophisticated as their Euramerican counterparts, and since it has been shown (Jahoda, 1956 ; Dawson, 1967) that Africans tend to have under-developed spatial skills, it appeared unwise to use the version designed for European adults ; in addition, it was anticipated that the group administration might have to be undertaken in unfavourable circumstances. Hence it was decided to use the new children's version, in spite of the fact that it is still being developed and that as yet no normative data are available.

In the adult versions of the PMT paths are represented by black lines, with the target dots positioned on their intersections. The current children's version has white paths against a black background, as illustrated in Fig. 1. It consists of two demonstration mazes, followed by 13 test items. A time limit of ten minutes was imposed.

The whole group of students had to be tested in a single session, by the writer with the help of two assistants. The two demonstration mazes were reproduced on a blackboard, and after the task had been slowly and carefully explained, subjects were asked to complete the first of the demonstration mazes. The test administrators then walked around to check and lend assistance whenever necessary : then the first demonstration maze on the blackboard was correctly completed, and any questions answered. Exactly the same procedure was followed with the second demonstration maze. Thereafter the actual test was administered. Selected subjects were later questioned about their views and reactions to the task.

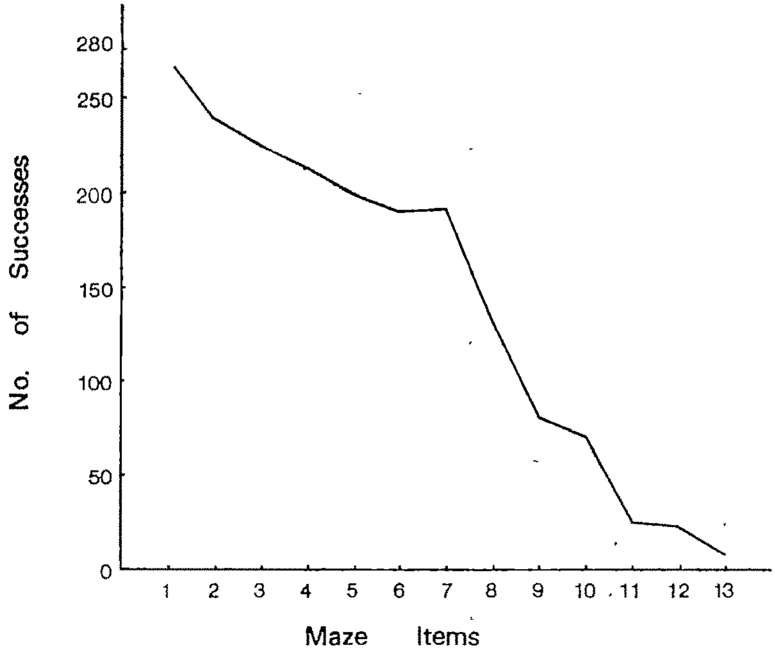
FIGURE 1
SAMPLE OF CHILDREN'S MAZE.



III.—RESULTS.

The possible range of scores is 0 to 13. The mean was 6.67, with a standard deviation of 2·89. The gradient of item difficulty appears in Fig 2. It would seem

FIGURE 2.
ITEM DIFFICULTY.



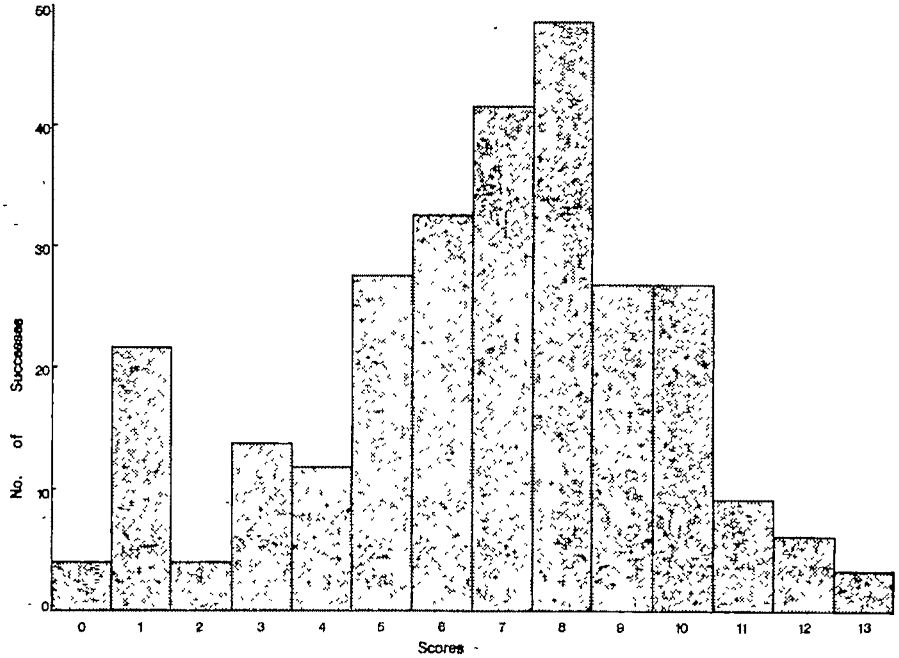
that the general order of the items is broadly right, but the rate of increase in difficulty seems somewhat excessive in the second half of the test. (The same has been found with British subjects, and will be remedied when this version is fully developed.) This is also reflected in the distribution of scores, shown in Fig. 3. A noteworthy feature of the distribution is the tendency towards bimodality, with marked bunching of scores at the lower end; this will subsequently be considered in more detail.

On the basis of individual testing of the sub-sample it was found that PMT correlated ·52 with Block Design, which has been shown in several African studies (Berry, 1966; Dawson, 1967) to be an effective measure of field-dependence. In fact, PMT correlated ·46 with EFT in the expected direction, indicating that it has a substantial component of field-dependence/independence. These results are consistent with earlier ones in Britain, in spite of the fact that the rectangular adult version had been used there. Thus, Elithorn (1955) obtained a correlation of ·74 between PMT and Block Design, though his were brain-damaged subjects. Beard (1965), working with normal adolescent boys, reported significant correlations of ·27 and ·40 with Gottschaldt tests, which according to Witkin, *et al.* (1962) are substantially related to EFT.

The influence of some background variables on performance was examined on the basis of the scores obtained by the group as a whole. Elithorn, *et al.* (1960) suggested that a bi-polar academic/non-academic factor was involved in PMT performance; and in their study with service recruits PMT correlated on the average ·4 with a test of arithmetical and algebraic abilities. While the Ghanaian students were of course homogeneous as regards educational level, they differed substantially in the content of their education; and science courses in particular place far more stress on numerical and spatial skills than arts ones. If formal education affects PMT performance, therefore, one might expect science students to do better, but in fact, there was no significant difference according to type of course.

FIGURE 3

DISTRIBUTION OF SCORES.



On the other hand, when the subjects were divided into those coming from literate and illiterate families, the former scored significantly higher (P less than ·01); hence it looks as if the nature of the early family background were a factor that outweighs subsequent formal schooling among this population. (Partial correlation, holding EFT constant, suggests that the influence of parental literacy is mediated by its effect on field-dependence; but in view of the small numbers in the sub-sample and the low correlations involved this must remain tentative.)

Lastly, in line with the finding by Davies (1965) on a British sample of normal adults, there was a significant (P less than ·02) correlation of —·23 between PMT and age; in this connection it should perhaps be explained that Ghanaian students cover a much wider age range than is usual in Britain or the United States.

IV.—DISCUSSION AND CONCLUSION.

It will be evident that in most respects the PMT functioned very satisfactorily in a different cultural setting. Some of the relationships previously established in British samples (e.g., with Block Design and age) reappeared, and an interesting new one with parental literacy was found.

The one major deficiency (leaving aside the gradient of difficulty which is in the process of being remedied) was the bunching of scores near the bottom. Perhaps it is best to dispose first of the tiny minority of subjects, just over 1 per cent, who scored zero. Possibly owing in the main to the unfavourable circumstances of test administration, and partly no doubt due to their personal limitations, these subjects totally failed to grasp the demands of the task. If they had been picked up in the course of the preliminary demonstrations and given further explanations, this could probably have been avoided.

The major problem, however, is presented by those 8 per cent who correctly completed the first maze, failing thereafter. On scrutinizing their total performance, and questioning some of them afterwards, it emerged that most of them had a mistaken notion of what they were required to do. Their conception of the task was that the points should always be linked by ***straight lines***, which most of them consistently attempted to do. This self-imposed task, namely to maximise the number of points on a straight line, was more salient for them than the prescribed number indicated below each maze; and the first test maze, but not subsequent ones, could be done in this way. When considering the source of this error, it became at once apparent that it stemmed from the fact that both demonstration mazes had two and three points respectively lying in a straight line, which created for some a dominant set; this was also confirmed by subsequent interviews. The obvious and easy remedy is to provide demonstration mazes that do not have this characteristic.

More generally, a number of studies (Ombredane, 1951; Silvey, 1963; Wober, 1966) have indicated the importance when testing in non-western cultures of providing subjects with ample opportunity to familiarize themselves with the task. The two simple demonstration mazes seem quite inadequate for this purpose. It may be suggested that a more extensive training series of, say, a minimum of six mazes be provided, with the last one or two being rather more difficult. Given this kind of modification, the PMT promises to become a most valuable instrument for cross-cultural work.

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SUMMARIES OF RESEARCHES REPORTED IN DEGREE THESES

CO-EDUCATION: ATTITUDES AND SELF-CONCEPTS OF GIRLS AT THREE SCHOOLS

By R. J. CAMPBELL

(Abstract of a thesis submitted in part fulfilment of the requirements for the degree of M.Sc., in the University of Bradford, 1968)

I.—AIM.

To compare attitudes to school, home, peers and self among pupils from a girls' school and girls from two co-educational schools; to examine whether these second-year pupils would show the same differences of attitude as the college students whose retrospective reports on school were analysed by Dale (1966).

II.—SUBJECTS AND PROCEDURE.

105 girls, aged 12 to 13 years, from the top two streams in each school, 52 from the girls' school and 53 from the two co-educational schools which serve the same city area. A sentence completion schedule was given under safeguard of anonymity. It was based on the schedule used by Bene (1957) and comprised 37 stems: e.g., ' When I am at home . . . ' ' I wish that I . . . ' ' There are times when . . . ' Responses were categorised as affective or neutral/factual; affective responses were then classified as favourable, ambivalent or unfavourable. Open-ended self-reports were obtained from use of the W-A-Y schedule (Kuhn and McPartland, 1954).

III.—RESULTS.

Analysis of responses to stems showed a significant tendency ($P < \cdot 001$) for girls in the single-sex school to regard school in a more hostile light than girls in the co-educational schools. To a lesser degree, a similar finding came from the responses to stems on attitude to home, girls in the single-sex school giving relatively fewer affective responses, and fewer of these being favourable responses. On attitudes to peers and self, there were generally no significant differences, except for some evidence of the co-educational pupils' greater awareness of their femininity.

The findings were tentatively interpreted in terms of the ' deprived ' environment of the single-sex school, of the parents who choose single-sex schools and of the teachers who teach in them.

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(Manuscript received 28th June, 1968)

PATTERNS OF FRIENDSHIP AND LEADERSHIP CHOICES IN A MIXED ETHNIC JUNIOR SCHOOL—A SOCIOMETRIC ANALYSIS

By M. O. A. DUROJAIYE

(*Abstract of a thesis submitted for the degree of M.A. at the University of Manchester,* 1966)

I.—Aims.

To determine the patterns of friendship and leadership choices of children attending a mixed ethnic junior school in a multi-racial area of Manchester; to examine the ethnic self preferences of white children, negro children, and children of mixed parents; and to investigate the relationship between the subjects' sociometric status and the social-psychological factors in their environment.

II.—The sample.

The total population of one junior school in nine forms aged 8 to 11 years: 202 white children, 77 negro children and 33 children of mixed parents; 165 boys and 147 girls. The parents were all of comparable socio-economic status, in an urban slum area of Manchester.

III.—Method.

Two three-choice, three-criteria, non-ranked, non-weighted sociometric tests were administered. Children were not asked to make rejections. In the friendship sociometric test, each child was asked to choose three friends boy or girl, from his or her form to: (*a*) play a game of rounders with; (*b*) have at a form's social party; (*c*) have as companion at the school camp.

In the leadership sociometric test, pupils aged 10 and 11 were asked to choose three children who were suitable as leaders for each of the following purposes: (*a*) a captain for the form's rounders team; (*b*) an organizer of a form project; (*c*) a co-ordinator for the purchase of a farewell gift for a teacher-friend who was leaving. The children were familiar with the activities enumerated.

High test-retest reliability was observed for both sociometric tests. Children's actual association also correlated highly with the sociometric responses.

In addition, children were interviewed to explore the reasons for their choices. Other data included intelligence quotients, attainment in reading and arithmetic, teachers' assessments, membership of extra-curricular organizations and length of stay in the school. The method of calculating ethnic self preference index devised by Crisswell (1943) was used.

IV.—Results.

(1) Patterns of friendship choices were found to be dependent on sex; but patterns of leadership choices were independent of sex.

(2) Ethnic grouping appeared to have influenced the choice of friends in every form. Significantly more white children, or negro children, or children of mixed parents chose friends from amongst children of their own ethnic group than could be expected by chance (P at least ·05 for each ethnic group in each form).

(3) Leadership choices appeared not to have been influenced by ethnic grouping in any form. Children of mixed parents, however, appeared to have been chosen most as leaders in every form but not significantly so.

(4) Although not all children achieving high sociometric status in the friendship test were chosen as leaders, all the children achieving high status in the leadership test also achieved high status in the friendship test (rank correlations between 0·35 and 0·92).

(5) Ethnic self preference occurred in every form and for each of the three groups. Ethnic self preference of white children appeared to be the strongest and most frequently observed, but that of mixed parentage children is stronger than that of negro children. White children and negro children preferred children of mixed parents more than they did one another. Mixed parentage children slightly preferred white children to negro children. Ethnic self preference appeared to decrease with age and length of stay at school.

(6) There were no significant differences between the ethnic groups in their motivations for making choice of friends. Teachers' assessment of pupils' behaviour, length of stay at school, intelligence, and membership of extra-curricular organisations were found to be associated with friendship sociometric status. Children emphasised ability for the criterion task as a reason for choosing leaders. Friendship choices appeared to be made in accordance with psyche-group criteria; leadership choices appeared to be made on socio-group criteria.

V.—References.

Crisswell, J. H. (1943). Sociometric method of measuring group preferences. *Sociometry*, 4, 398-408.

(*Manuscript received* 15*th August*, 1968)

OCCUPATIONAL CHOICE AND SPECIAL EDUCATION OF EDUCATIONALLY SUBNORMAL CHILDREN

By M. O. A. DUROJAIYE

(*Summary of a thesis presented for the degree of Ph.D., at the University of Manchester*, 1968)

I.—Aims.

To compare the occupational choices of educationally subnormal pupils in special schools with those of ESN pupils in special classes of ordinary schools; to compare the provision for ESN pupils in special schools and special classes of ordinary schools; and to examine the relation between the ESN pupil's occupational choice and the type of special education received.

II.—Samples and methods

(i) *Head Teachers and Teachers.*

20 head teachers of special schools, 40 head teachers of junior schools with special classes, and 40 head teachers of secondary modern schools with special classes gave information by questionnaire on organisation, methods, discipline and educational aims.

100 teachers, 20 each of teachers of children in (*a*) special schools for ESN pupils, (*b*) special classes in ordinary junior schools, (*c*) special classes in ordinary secondary schools, (*d*) ordinary junior classes, and (*e*) ordinary secondary classes, gave information by questionnaires on their professional careers, their contact with pupils' parents, and their attitudes towards teaching.

(ii) *Pupils.*

180 ESN pupils from special schools, 180 ESN pupils from special classes in ordinary schools, and 180 non-ESN pupils from ordinary schools participated: in each of these three categories, there were 30 children of each sex from each of three

age groups (8–10, 11–13, 14–16 years), all from homes of comparable socio-economic status. By tape-recorded interview for ESN pupils and questionnaire for non-ESN pupils, children were asked about their occupational choices, expectations and aspirations: their interests and dislikes for jobs, hobbies and school subjects; their part-time jobs (if any); places of work they knew and had visited; and occupations of parents, relatives and friends.

(iii) *Ex-pupils.*

120 ex-pupils, 40 from each of the three sources, were followed up. Their occupational choices before leaving school were compared with their occupational attainments. More intensive investigation of 60 of these ex-pupils (20 from each source) surveyed the opinions of employers, parents, and the ex-pupils themselves.

III.—Results.

(1) Responses of head teachers showed that special schools for ESN pupils are more adequately staffed than junior and secondary schools with special ESN classes. More head teachers of special schools claimed unqualified satisfaction with discipline in their schools than the other two categories of head teacher. More special schools had an employment-oriented curriculum than secondary modern schools with special classes.

(2) Teachers for ESN pupils in special schools appeared to be better prepared for their task than teachers of ESN pupils in ordinary schools. Teachers of ordinary classes in secondary schools appeared stricter in discipline, less democratic and less emotionally involved with their pupils than other teachers. Most teachers mentioned pupils' achievement as their greatest source of satisfaction, and emphasised pupils' failures as their main frustration.

(3) More ESN pupils from special schools chose unskilled jobs than did ESN and non-ESN pupils in ordinary schools, in each of the three age groups and in both sexes. Special school children appeared to depend more on the school for occupational choice, while children from ordinary schools mentioned the influence of relatives and friends most.

(4) Follow-up of ex-pupils showed close agreement between the jobs pupils chose before leaving school and the jobs they held after leaving school. There was no significant difference between the degree of occupational adjustment achieved by ex-pupils from the three school sources.

(5) Factor analysis revealed that a factor of occupational awareness is one of the most important in occupational choice and that the school variables have substantial loadings on that factor.

(*Manuscript received* 15*th August*, 1968)

INTERESTS, VALUES AND PERSONALITY TRAITS OF STUDENTS SPECIALISING IN DIFFERENT FIELDS OF STUDY IN UNIVERSITY

By AMAR J. SINGH

(*Abstract of a thesis submitted for the degree of M.A. in the University of London*, 1965)

302 full-time students (155 men, 147 women) specialising in four fields of study (Humanities, Science, Social Science, Education) in their second year at London University and Brighton College of Education were given the F-scale, the Maudsley Personality Inventory, the Allport-Vernon Study of Values and the Vernon

Interests Survey. 21 measures were derived from these scales; 20 of these showed significant differences between mean score of men and women. Analysis of variance indicated that differences between subject fields constituted the major source of variance.

Selected examples of differences in mean scores include the following: On authoritarianism, Education women and Science men had the highest mean scores, and Social Science women the lowest. On extraversion, Education men and women had the highest mean, and Science men the lowest. On neuroticism, Humanities and Education women had the highest mean and Science men and women the lowest.

Factor analysis, applied to intercorrelations for men and women separately, extracted five principal components in each analysis, closely similar in pattern for both sexes.

(*Manuscript received 5th July*, 1968)

CRITICAL NOTICE

Psychologists in Education Services. The Report of a Working Party appointed by the Secretary of State for Education and Science: The Summerfield Report. London: H.M.S.O., pp. 171, £2 5s.

By WILLIAM CURR

(*School of Education, University of Birmingham*)

To the naive reader, the title is misleading. This is a report on psychologists qualified for work in Child Guidance or School Psychological Services of a local education authority: the terms of reference on page 1 make this quite clear.

This special use of ' Psychologist ' is well-entrenched by usage and tradition, but it is still confusing. The discussion has little relevance to the role of educational psychology and psychologists in what the report repeatedly calls "the wider world of education." There could be great value in a similarly documented report on the role of educational psychology in initial training of teachers, in higher education for experienced teachers, in the advisory and administrative field, in remedial education, in the universities—but the Summerfield Committee was not given that task. Secondly it must be remembered that the Committee deals only with England and Wales. The ' radically different ' conditions prevailing in Child Guidance and School Psychological Services in Scotland receive only passing comment.

With terms of reference thus doubly restricted, it is commendable that Chapter 1 sets the report in the wide perspectives indicated by the chapter heading: " Influence of psychology on education today." These 5½ foolscap pages, with their 53 references, would give teachers and students of education an admirably concise and balanced conspectus of four major growing points in educational psychology (not child guidance !) namely the importance, for sound development, of rich and stimulating early environment, the role of language in intellectual development, the advent of programmed learning and the widening of the concept of individual differences to include assessment of *quality* in cognitive processes and of imaginative and creative thought. " These lines of enquiry have implications for education and for remedial education " (1.19). They have indeed—and for the whole concept of Child Guidance and School Psychological work.

From the questionnaire completed by education officers Chapter 2 extracts a verbal identikit of the typical psychologist in LEA service—his age, sex, salary, training, experience and work. Increasingly, he is a young man, not trained as a teacher, and with less teaching experience. The work-analysis shows a preponderance of clinical, diagnostic, individual, therapeutic duties, rather than advisory, educational, preventive and group work. This may reflect conditions of staff shortage and pressure of cases; when every hour has to be devoted to reducing a debit balance on the waiting list there is no spare time to invest in preventive work which might pay dividends in a reduced flow of cases in the long term. Only one in six spends more than a tenth of his time *discussing* the children with anyone. (Teachers say, " You come and see the children but never tell us what to do about them ".) The questionnaire includes few items that could be called preventive and educational; few respondents found it necessary to add them. Services with which contacts were frequent were mainly those concerned with children already in some trouble; contacts with potentially preventive agencies like youth employment and youth service were the lowest two in the frequency list. Staff shortages are enormous; a third of all services are running at a quarter below strength. The Midland areas with their pioneering record (Leicester SPS 1931, Birmingham CGC 1932) are among the most poorly staffed and give low estimates of staff need in relation to population.

Chapter 3 has two major themes—a plea for co-operation between psychologists and other services concerned with children, and a warning that psychologists should not be employed in duties in which their training and skills are underused. Nothing but benefit could arise from close co-operation of school psychologists with careers guidance, counselling, nursery education, training centres for the handicapped, children's departments, courts, probation and youth services. The warning to conserve psychological skill raises more fundamental issues. There was a substantial demand from chief education officers that psychologists should help in Remedial Education, ascertainment of ESN children, group test surveys, advanced education for teachers and educational research. The report takes the view that much of this work must be done by non-psychologists. Unless and until the output of " Child Guidance Psychologists " can be raised—as in Scotland—to such a level that enough are available to provide these extra services—as well as a greater proportion of preventive, advisory and educational work—the logical way to meet these needs is by a body of teachers who have studied the psychology of education beyond the level attempted in their initial professional training for teaching. Many of the CEOs' demands could be met just as well by a psychologically educated teacher—perhaps better since Child Guidance psychologists will be increasingly without teaching experience if we accept the recommendation in Chapter 4.

Two Professions or One ?

Chapter 4 considers the four types of qualification commonly associated with work in Child Guidance or School Psychological Services—an honours degree in psychology, professional training for Child Guidance, experience as a teacher, and professional training for teaching. There will be fairly general support for the recommended academic level. There are two commonly-used routes to its attainment, either (*a*) a first degree with honours in psychology, or (*b*) a higher degree, usually an English or Welsh MEd or a Scottish old-style Bachelor of Education (now also MEd). Of the psychologists in service at the time of the Summerfield enquiry, 78 per cent had qualified in psychology by means of a first degree, and 20 per cent by a higher degree in psychology, following a first degree in some other field. Within the 20 per cent, 12 per cent were Scottish Bachelors of Education or M.Eds. The relative virtues of the two routes are not discussed ; increasingly Child Guidance psychologists in England and Wales follow the former, and the report concludes that this must continue to be the major source of supply. On this ground further data are obtained from all psychology departments in the United Kingdom on the output of graduates, their interest in Child Guidance, and the opinions of professors about the requirements for work in that field—but no corresponding data are presented from education departments. Yet only one in seven of psychology undergraduates is interested in Child Guidance as a career (the corresponding proportion of Scottish EdBs. or MEds is one in two). At a later point in the report, reasons are discussed for the undergraduate's lack of enthusiasm for a Child Guidance career, but those who take a first degree in psychology would not be expected to be so interested in educational matters as those (already teachers) who take an M.Ed.

About three psychologists in five take some form of postgraduate professional training—directed specifically to Child Guidance or School Psychological work, but much less relevant for those who ' migrate ' into colleges of education or universities or advisory posts, though experience of *work* in Child Guidance may be an excellent qualification for these.

31 per cent of psychologists had not trained for teaching, but only 11 per cent had no experience of teaching. 50 per cent had taught for less than five years ; the average duration of teaching experience before migration to Child Guidance is decreasing. The Report gives this trend its blessing. Yet it is perhaps a consequence of shortage rather than of a new perception of the needs of the work.

Is teaching experience really necessary in Child Guidance ? The Report quotes the BPS as divided on this issue—though it was decisive when it " assumed . . . some experience of teaching children " in its evidence to the Underwood Committee in 1951. The Ministry of Education (1948) maintained that " teaching experience should be regarded as essential." The Underwood Committee agreed. On the other hand, professors of psychology " said emphatically " that the need to teach deters undergraduates from considering a career in Child Guidance. The Committee—

very fairly quoting the contrary opinions—regards the demand for teaching experience as a tradition which has arisen from two causes: (*a*) the School Psychological Services developed through *teachers* deciding to study and work in psychology and (*b*) much of the financial support for intending educational psychologists has come in recent years from the Ministry of Education (Department of Education and Science) and has therefore gone to teachers. Three possible rational justifications for the tradition are, however, examined at length. As a way of acquiring good relationships with children teaching experience is considered " of value but not essential." It is argued that two to three years' teaching might be inadequate for the achievement of these relationships, while a longer period might make difficult the subsequent adjustment to the role of psychologist. " Educational psychologists have first to learn from children, rather than to teach them "—but this is just as true of teachers ! Certainly there is often initial conflict between the diagnostic and didactic roles, but it is perhaps the salutary resolution of this conflict that makes the ex-teacher a sound psychologist, and the teacher who has worked in Child Guidance a good teacher of teachers. Secondly, teaching experience is said to improve a psychologist's relations with teachers, but this, says the report, " infers " (surely " implies " is meant) " an inappropriate role for educational psychologists " who are " not . . . members of the same profession." A radically different conception of the place of the psychologist within " the wider world of education " prevails in Scotland where, over 20 years ago, psychologists were recognised as a section *within* the Educational Institute, and their salary scales were brought within the framework of the scales for teachers.

To the claim that teaching gives insight into the education service the Report replies that " knowledge of the scope, history, structure, methods, current problems, policies and philosophy of education . . . could be better imparted systematically as part of a post-graduate course in educational psychology " ! Some part ! How many DEP courses would claim to impart it ? Such a vast addition to the content of professional preparation would need at least a whole extra year ; there might be hope of achieving it in the two-year course proposed in Chapter 7. This would amount to something very like a Scottish old-style Bachelor of Education course, though with the psychology directed to the Child Guidance application. Even then, the *understanding* of this body of educational knowledge might be limited without classroom experience.

The Report concludes that there is no justification for continuing to regard teaching experience as essential for psychologists—yet the chief reasons for its abandonment seem to be the shortening of the period before qualifying for Child Guidance, and the expected consequent increase in the attractiveness of the career. These, however, are surely matters of expediency, a reason the BPS properly refused to countenance as a ground for lowering academic requirements. The seven-year minimum duration of preparation for a career in psychology is repeatedly referred to as a long training to undertake before entering one's profession—but the years spent in teaching are (or ought to be) valuable professional service. If Child Guidance and teaching are seen as one profession, the teaching years cease to appear like an irksome period of useless compulsory National Service. Ironically, the total effect of all the Report's recommendations on output and supply would be to produce —in some 30 years—a ratio of psychologists to population about the same as has already been achieved in Scotland—where almost every psychologist is a trained and experienced teacher. There must be more effective ways to increase psychologist output than merely detaching psychologists from the teaching profession.

Chapter 5 returns to more factual matters of supply and demand—though these are not independent of the fundamental issues of the preceding chapter. The reported increase in psychology graduates is impressive—from 200 in 1960 to 667 in 1967—a total of 3,000 graduates in 8 years. Of those who proceed to train for Child Guidance, a quarter become ' instant migrants ' departing for another career immediately on concluding their costly and highly specialised training. Of those who migrate later, the Association of Educational Psychologists reports that over a third become Lecturers in Education. Such migration is considered by the committee to be " appropriate and desirable," but if the work of these lecturers is to extend beyond topics related to Child Guidance, it is to be hoped that they have had experience in education, and that their DEP courses have not been too narrow. It is clearly not economic to recruit lecturers from a course directed to ' another profession '—more particularly when advanced courses exist which have the special aim of preparing teachers for work as college lecturers.

Why do they leave ?—because of lack of research opportunities, doubts of the value of the work, a sense of being swamped by individual cases. The report considers it natural that after five years or so some educational psychologists will seek opportunities in the wider field of education, where they are less involved in individual guidance and have more opportunity to influence the general quality of education—a movement in line with the growing tendency to see more hope in the therapeutic community than in individual therapy.

In estimating future output, the Report takes into account population growth, output of graduates, instant and deferred migration and losses by marriage and retirement, and concludes that the 35 training places available must rise to 90. There would be little difficulty in filling extra places ; some training centres which had vacancies ten years ago now have a selection ratio of one in five.

Chapter 6 gives description and example of the work of a psychologist. Without adducing evidence, the report advises that " Child Guidance should be run on an inter-disciplinary basis whenever possible," though this organisation of Child Guidance (like the expectation that psychologists should have taught) may be said to be largely traditional in origin and due to the availability of funds. (The ' team ' approach—psychologist, psychiatrist and psychiatric social worker—was favoured and financially supported by the Commonwealth Fund of America, as the historical appendix records).

The sole psychologist is warned quite properly against the illusion that he is a ' one man team ' but the Child Guidance and School Psychological Service are firmly placed in the administrative charge of the LEA. Open referral—the right of direct access to the psychologist by any teacher, parent or guardian of a child in trouble—is strongly and soundly recommended. Ascertainment of the educationally subnormal is regarded as too large a task to be realistically attempted, and is by implication left in the hands of the school medical officer, who has had three weeks' intensive training. If it is impracticable for psychologists to attempt these 80,000 or more tests a year, they—like remedial education—would be more appropriately carried out by specially trained experienced teachers.

Among measures to increase and improve training facilities, discussed in Chapter 7 and Appendix 7A, are suggestions for increased output from existing centres by delegating some practical supervision to staffs of neighbouring LEA Child Guidance Services, for training schemes run by local authority services with help from neighbouring universities, for new training centres set up jointly by local education authorities and universities and based on a Demonstration Clinic, and for a two-year postgraduate course in education and psychology, somewhat resembling the Scottish EdB or MEd. Like the proposal to establish advanced courses for qualified and experienced psychologists, many of these schemes have admirable features but might well be impracticable simply because of the existing pressure on understaffed LEA services and on universities. Financial assistance to students through ' instant secondment ' (appointment as a psychologist with promise of immediate secondment to a training course) is commended, with a proper warning to LEAs to ensure the probable acceptability of the candidate for training before confirming the appointment. It may be doubted whether financial difficulties will appreciably affect output until the number of training places is greatly increased ; some centres could easily fill all places even if half the suitable candidates had to withdraw for lack of funds. More prominence might well have been given to the passing suggestion that LEAs be encouraged to second appropriate teachers on salary to take a psychology degree or two-year MEd. Such rare secondments have already produced some excellent psychologists (with teaching experience) and might well produce many more.

The one-page final chapter is a plea for priority to be given to education and welfare: "increasing prosperity means that human beings will be able to work for each other's well-being as . . . never . . . before; they will indeed need to do so."

There is much of interest in the appendices—a potted history (in four foolscap pages) of the psychological services, a digest of the evidence from training institutions and psychology departments, a note on the needs of Wales and on the dual system of psychological provision in the USA, and admirable charts of Child Guidance provision in every LEA in England and Wales. A sociologist might profitably seek the causes of the striking disparities even between similar areas, the profusion of psychiatrists in Canterbury and Swansea, the bleak empty desolation in many areas from Ipswich to Birkenhead. There are some unfortunate oversights in proof-reading; the English-speaking psychologist in Wales is startlingly referred to as a Mongolot! The index is excellent.

This is a readable report—clear and unequivocal. A pity the terms of reference did not include the other half of the story—the emergence of a growing body of teachers equipped by advanced study to meet many of the other needs referred to in the report and in the evidence from chief education officers. Such an extension of the remit would fulfil the promise of the title, explore the implications of the splendid opening chapter, and respond to current interest in environmental stimulus and educational techniques, which might greatly reduce—though never eliminate—the need for individual guidance and therapy.

BOOK REVIEWS

ARMSTRONG, D. M. (1968). *A Materialist Theory of the Mind.* London: Routledge and Kegan Paul, pp. xi+372, 50s.

The author of this book, who is a Professor of Philosophy at the University of Sydney, aims " to show that there are no good philosophical reasons for denying that mental processes are purely physical processes in the central nervous system and so, by implication, that there are no good philosophical reasons for denying that man is nothing but a material object." He is quick to point out that the empirical confirmation of such an identification of mind and brain must in the long run come from neurophysiology and from psychology; his more modest role, as a philosopher, is to show that there are no logical or conceptual difficulties involved in this physicalist thesis. " Like John Locke, I am," he writes, " an underlabourer carting away rubbish from the path along which I conceive, or guess, that scientific progress lies."

The book itself is divided into three parts. In the first, the writer presents a classification of theories of the mind. These theories, such as, most notably, dualism and behaviourism, are then searchingly criticised. Finally, a long last chapter presents and defends from many objections " the central state theory," Armstrong's own theory that mental states are simply physical states of the central nervous system (though previous similar views from such philosophers as Place and Smart are readily acknowledged). In the second part of the book, an attempt is made to apply central state theory to a wide variety of ordinary, non-technical psychological concepts, such as the will, knowledge and inference, perception and belief, mental images, bodily sensations, introspection and so on. Part Three consists of a short chapter wherein some final objections that might be raised against a materialist theory of the mind are considered and rejected.

It is important for psychologist readers to remember that this book " is written by a philosopher, and written primarily for philosophers "; Armstrong is perfectly well aware that many psychologists tend to identify mind and brain, and cites Hebb as a distinguished example. His problem, rather, is that many philosophers find this a ' paradoxical ' view. So it would be unfair to react to this work by wondering what all the fuss is about, for it is not primarily intended for psychologists. Perhaps for this reason, few psychologists will read it. Of those who do, it is safe to predict that many will be irritated by Armstrong's lack of reference to detailed psychological and physiological findings. Indeed, it might be argued that he would have been less sanguine about the eventual (empirical) prospects of linking all mental events to physiological states, if he had cited something of what is known of cerebral localisation. Another possible criticism that the psychologist reader may make is that, although he is ready to admit that all psychological happenings have their (as yet largely unknown) physiological correlates, a much more interesting question—to psychologists at least—is whether we can (logically) explain human behaviour solely by reference to physiological and other physicalistically defined variables; and this is an issue, much debated in recent philosophical psychology, that Armstrong fails to discuss at length.

But these are minor, and maybe irrelevant, criticisms. Nothing that can be said in the space available can possibly do justice to the beautiful clarity of this book, or to the sustained and ingenious argument it contains. For psychologists with philosophical interests it is unhesitatingly recommended.

G. W. PILKINGTON.

BURTON, L. (1968). *Vulnerable Children.* London: Routledge and Kegan Paul, pp. 277, 35s.

This interesting book comprises three studies: Accident Involved Children, Sexually Assaulted Children, and Children with Asthma. It is the author's thesis that such children contribute largely to their own misadventures or condition through trying to satisfy the particular personality needs which have arisen in them, or are more urgent for them, as a result of negative maternal attitudes during pregnancy or later. The sub-title of the book is " Children in Conflict."

The 20 and 25 children of the first and third study were patients of Belfast City Hospital. Each was matched with a control (non-accident, non-asthma) child for age, intelligence and family position. The names of the 41 sexually assaulted children were obtained from police records. A noteworthy feature of this second study is the ingenious matching of each subject with four controls, partly in order that they would not feel that they had been picked out specially for what purported to be a study of personality at different ages, but also in order to provide a stronger test of the hypotheses.

Each study has a chapter on previous work in the area, from which basic hypotheses were formulated. These were tested by means of four principal research tools:

(1) The Bristol Social Adjustment Guide (Stott and Sykes, 1958).

(2) A picture-story test (Murray's T.A.T.) given to the children and to their mothers.

(3) A Parent Attitude Research Instrument (Schaefer and Bell, 1959).

(4) A questionnaire devised by the author for interviewing the mothers about their behaviour and feelings towards the child, and his behaviour and feelings, throughout his development.

With the exception of the picture story test, then, the data came from adults' reports. Yet Mrs. Burton's handling of the T.A.T. administration suggests that she is gifted in face-to-face relations with children. A structured interview with the children, parallel to that given to the mothers, would have been valuable. It seems a contradiction that Mrs. Burton should express disapproval of subjective judgments and yet accept what amounts to hearsay evidence of the children's feelings (although she could argue that she obtained confirmation of these from their T.A.T. stories). Another minor criticism is that the idiosyncratic language of Stott's Guide is used throughout the book without preliminary definitions. While the term ' unforthcomingness ' is vivid and unequivocal, the same cannot be said for other terms, such as ' unsettledness ' which does not have the ordinary meaning of restlessness and is confusing when applied without explanation, e.g., to the asthma children who were characterised as listless and apathetic.

In the main the three studies establish significant differences between the experimental and control groups in accordance with the hypotheses. The author would be the first to warn against assuming the relationship of personality needs and the particular misadventure to hold for any individual child (in at least one of the road accidents described the relationship seems unlikely). Mrs. Burton disarms criticism by her own stress on the retrospective nature of her studies with its inherent dangers. " Consequently," she says, " conclusions as to the aetiology of the child behaviour observed are always viewed as tentative. The studies represent careful attempts to explain how the behaviour might have been caused, but they do not offer concrete evidence of its causation. For this, large scale developmental studies would be necessary." Indeed, confirmation of Mrs. Burton's provocative thesis could be sought in the longitudinal studies now in progress, e.g., in California, London and Scandinavia. Her book is a welcome addition to the psychology of personality development in the social context, as well as being of special interest to family caseworkers and to teachers concerned with emotional needs of children.

RUTH BOWYER.

CROSBY, A. (1968). *Creativity and Performance in Industrial Organisation.* London: Tavistock Publications, pp.xiii+197, 42s.

This is a difficult book to review fairly; the triviality of its early chapters will annoy the psychological reader, whilst the book's conclusions have little to offer to the educationist. On the other hand, it may well turn out to be an important treatise for industry. Certainly, its insightful comments on the shortcomings of traditional management patterns ought to be read by every British industrialist. Crosby makes an apology to both industrialist and scientist, however, fearing that his text will satisfy neither party, being too ambiguous for the former and not sufficiently exact and cautious for the latter. This scientist would confirm that on the psychological side at least, Crosby's fears were well founded. The first half of the book presents a review of theory and research on the two topics " the nature of industrial problems " and " the nature of creativity." Crosby's view of the structure and function of industry (with a breakdown of the personnel function listing ' Welfare ' first and giving pride of place to ' Cafeteria ') is old-fashioned and a trifle superficial. His resume of the psychological factors involved in creative problem solving is also lacking in depth and is based largely on previously published popular reviews of the topic. Specifically, the author's use of a 1949 general introductory text in psychology as source reference for his description of " major modifying factors " influencing perception and judgment, is somewhat out of place in a specialised book published in 1968. Furthermore, his assertion that the recent discovery, that intelligence " is related to creative ability to only a limited extent " has caused " psychologists to establish the composition of intelligence," makes one wonder what Burt, Spearman, Thompson, Thurstone and the rest *were* investigating !

Crosby is not a psychologist and freely admits this. He is much happier in describing the personality of the creative person—this chapter providing a most useful and well reasoned summary statement. Again, in describing the present state of industrial organisations and in isolating the " features of organisation relevant to creative performance," Crosby is on much happier ground and displays a better knowledge of his subject matter. In short, this is not a book for the psychologist or educationalist, but could well be a useful addition to a Business Manager's bookshelf. However, the book lacks clarity of purpose and if Crosby is correct in his assertion that British industrialists only listen to, or read, clear cut, unambiguous messages, they may well miss this one.

GEORGE SHOUKSMITH.

INTERNATIONAL UNION OF PSYCHOLOGICAL SCIENCE (1966). *International Directory of Psychologists* (2nd Ed.). Assen, The Netherlands: Royal Van Gorcum. No price.

This is the second edition of a Directory first published in 1958. Name, address, age, qualifications, appointment and interests are given for 8,000 psychologists in all countries in the world, except U.S.A. (covered by the A.P.A. Directory of Psychologists in the United States) and the Chinese People's Republic (which refused to participate).

LIPSITT, L. P., and SPIKER, C. C. (Edit.) (1967). *Advances in Child Development and Behaviour, Volume* 3. New York: Academic Press, pp. 272, 76s.

This is a collection of seven articles, with the following titles and authors. " Infant Sucking Behaviour and Its Modification " (Herbert Kaye); " The Study of Brain Electrical Activity in Infants (Robert J. Ellingson); " Selective Auditory Attention in Children " (Eleanor E. Maccoby); " Stimulus Definition and Choice " (Michael D. Zeiler); " Experimental Analysis of Inferential Behaviour in Children " (Tracy S. Kendler and Howard H. Kendler); " Perceptual Integration in Children "

(Herbert L. Pick, Junr., Anne D. Pick and Robert E. Klein); " Component Process Latencies in Reaction Times of Children and Adults " (Raymond H. Hoyle). As the editors write in their preface, " No attempt is made to organise each volume round a particular topic or theme."

Whether one considers this book of value, or not, will depend largely on whether the reader shares the behaviourist orientation of the authors, which sometimes seems extreme. Sucking is called 'sucking behaviour'; inference is called 'inferential behaviour.' " Choice, as the term is used here, refers to reponses to the test stimuli and not to some process assumed to determine these responses."

To this reviewer, these appear as experimental studies in which the subjects happen to be children. E.g., " The *sucking response* has many positive attributes which recommend it as a dependent variable in studies of behaviour modification." In other words, this topic was chosen largely for its suitability for experiment, rather than for its importance in early development. Some of the other topics such as 'selective auditory attention' or 'inferential behaviour' are of considerable potential interest to educational psychologists and teachers. But certain important variables appear to have been ignored by the authors. Whether or not children pay attention or not surely might be affected by interest and motivation: these factors are not mentioned. Although the authors of the latter study found that " inferential solutions increased with age and that verbal labels interacted with age to affect such behaviour " (bravo !) neither Piaget's nor Bruner's work in this field is alluded to.

The experimental methodology is of a high standard; but it is hard to feel that these studies are by people who have brought up children, or taught them, or looked after them, or played with them, or tried to sort out their problems. Readers whose chief interest is in experimentation may think highly of these studies, but they contribute little to the needs of those whose work is mainly concerned with children.

RICHARD SKEMP.

NEWSON, JOHN and ELIZABETH (1968). *Four Years Old in an Urban Community.* London: Allen and Unwin, pp. 570, 60s.

The second volume of the Newsons' study of child-rearing in Nottingham is a worthy successor to their pioneer work on infant care. They begin with an effective plea for the interview as a research tool, and in fact their schedule, used with 700 mothers in a carefully constructed sample, is in many ways a model of its kind. They argue, with justification, that the interview allows access to facets of behaviour inaccessible by any other method. They also insist that they did not start with any hypotheses but deal with the material along 'natural lines of cleavage.' This sounds much like a purely descriptive fishing expedition, while in fact their design has clearly been inspired by shrewd theoretical ideas of what is relevant; this is evident from a mere scanning of their topics such as independence, social learning and the control of aggression, toilet training and so on. The voluminous material collected on all this has been sifted in a highly skilful manner, yielding a harmonious blend of quotation, tabulation and comment. A touch of historical or cross-cultural background helps to set the data in their proper perspective, and due weight is also given to ecological factors such as housing.

The main line of 'natural cleavage' to emerge is social class, and the subtle class differences in the basic approach to the child, as well as in the handling of children in concrete situations are brought out in sharp focus. Throughout the book readers come across familiar themes in a new light, old assumptions are challenged in passing and fresh problems posed. Here are a few examples that happened to strike the reviewer: each method for dealing with bed-wetting, be it kindness or severe punishment, 'worked' with some children; punishment in a family setting cannot be directly compared with punishment in a laboratory situation, so that the evidence from the latter is of doubtful relevance to problems of socialization; too much consistency in child rearing might prevent the child from acquiring social flexibility and understanding. It should be added that such remarks can only be properly savoured within their context of rich descriptive material.

One thread that runs through the book is the constant *interaction* between parent and child, as opposed to the notion of socialization as something the parent does to the child. This is not a new idea for developmental psychologists (though the traditional view still tends to dominate the texts), but the detailed nature of the process is very fully documented. This active intervention by the child suggests one problem of method not clearly faced by the authors: to what extent could the presence of the child have affected the content of the interview? Would a middle-class mother discuss, for instance, her child's bed-wetting quite freely in such circumstances? It would, of course, be difficult in practice to exclude the child, but in future studies (to be eagerly awaited) where the sample will be followed up this point is likely to become increasingly important. When the subsequent volumes appear an unprecedented source of knowledge about variations in child-rearing norms will be built up, which no one professionally concerned with child behaviour can afford to miss; and to crown the edifice, the Newsons hold out the prospect of a study relating child rearing to personality. On their own evidence, this is going to be a daunting task, and in the meantime we must be grateful for what they have given us so far.

GUSTAV JAHODA.

OAKLEY, R. (Ed.) (1968). *New Backgrounds: The Immigrant Child at Home and School.* Oxford University Press, pp. vi+136, 12s. 6d.

The six contributors to this book, all social scientists of one sort or another provide a wealth of information about the family and educational backgrounds of West Indian, Cypriot, Indian and Pakistani immigrants to this country. Their book ought to be read not merely by the teachers for whom it is primarily intended but also by all those who are concerned about making our society a genuinely multi-racial one in which people of all colours and creeds will be accorded the same rights and privileges. All the essays are deeply interesting, but it is a pity that the one on *The Pakistani Background* is written in rather cumbrous English. The first four essays outline the social and cultural backgrounds of the four major groups of Commonwealth immigrants in this country and highlight the main features of the structure of the family, religious outlook and attitudes to education that are likely to produce problems when parents and children settle in this country. The fifth essay, by a psychiatric social worker, deals with the psycho-social problems of immigrant families (a field on which little has so far been published) and cites some illuminating case histories of immigrant children who were referred to a child guidance clinic. The final essay, entitled *School—The Meeting Point*, considers the implications for the teacher and the school of the findings of the previous five essays. To each essay is appended a valuable list of suggestions for further reading.

In a brief review it is impossible to do justice to all the fascinating material in this book. Among the points it illustrates particularly well are the differences between the British, West Indian, Greek, Cypriot, Sikh, Hindu and Pakistani concepts of 'family' and 'home', variations in the 'language of feeling' and the ambivalence of the immigrant parent's attitude to English schooling. On the one hand, he sees the school as the means of access for his children to full membership of the British community; on the other, he sees it as undermining the values of his own culture and as tending to alienate his children from their family and their own culture. West Indian and Greek Cypriot parents often deplore the 'permissiveness' of English schools. It would seem that what most immigrants seek is 'accommodation' to life in this country rather than 'integration'—the opportunity to preserve their own religious faith and way of life in British society in much the same way as British Jewry.

It is to be hoped that this book will be widely read in this country. A. LAING.

STORR, A. (1968). *Human Aggression.* London: Allen Lane, The Penguin Press, pp. 122, 25s.

It is hardly surprising, given the current upsurge of violence on the national and international scene, that society is becoming increasingly concerned about the phenomenon of aggression. Not that there is anything new about this phenomenon, but its potential scale is becoming such that attempts to understand it and, hopefully, to control it are becoming more urgent than ever before. What have the social sciences to offer in this respect?

Hard on the heels of Lorenz's book *On Aggression* comes Anthony Storr's most readable and thought-provoking monograph. Storr is one of those psychoanalysts who have read books other than those by Freud, and it is to ethology (at any rate as represented by Lorenz) that he turns for new insight. Freud's view of aggression had been an essentially pessimistic one: he had regarded it as part of the death instinct and as such opposed to the pleasure principle and primarily concerned with destruction. It is against this negative view that Storr summons all his arguments in this book, for the thesis which he advances is that aggression is Janus-like: not only does it refer to man's violent destructive tendencies but it also contains within it functions of a positive, constructive nature that form a valuable and indeed biologically essential part of the human mind. Taking his cue from the ethological point of view, that aggressive tendencies in animals are not concerned with destruction *per se* but have a survival value in situations involving overcrowding, mate selection, and hunting, Storr endeavours to show that in man too aggression has an essentially positive role to play in the mastery of the external world, the achievement of dominance, and the overcoming of obstacles. Without aggression, he maintains, there would be no initiative, no striving, but only passivity. Without it, indeed, man could not have survived as a species. The argument, therefore, that aggression is a wholly dangerous and undesirable tendency of which we must rid ourselves must thus be rejected.

Storr is a persuasive writer, whose erudition enables him to range far and wide in search of support for his thesis. As a therapist, it is understandable that he should be drawn to the ethological study of impulsive behaviour and that he views the studies of aggression by academic psychologists under laboratory conditions with scepticism. Yet how much he has missed by not acquainting himself with social learning theory and the studies of aggression by Bandura and his colleagues on the one hand and with the views of motivation current amongst psychologists on the other! Part of Storr's trouble is that he treats aggression as a 'thing'—a unitary entity within us that must find relief in overt expression from time to time, so that, if blocked in one direction, it must be discharged in another. Such a hydraulic model of a motivational tendency is, however, no longer tenable, and the consequent view of aggressive outbursts having a cathartic function has in fact been challenged on the basis of experimental results. It is, moreover, a pity that Storr perpetuates the old rigid division between the innate and the learned: not only does he carry Freud's view of aggression as an instinct to the length of suggesting that man has an "innate hostility towards his neighbour" (p. 36), but he also fails to do justice to the considerable body of literature on the shaping influence of a child's social environment on the intensity, manner of expression, and objects of aggressive tendencies. As a result, the chapter on aggression in childhood development is one of the weakest parts of the book—a pity, not only because of the practical implications of the developmental point of view but also because here we have one area where armchair theorising is being rapidly replaced by empirical data. But then one rather suspects that Storr does not have much use for the laboratory approach; at any rate he is at his best when, in the final chapters, he describes the pathological manifestation of aggression in such conditions as paranoia, depression, and psychopathy with all the sympathy and insight of the therapist.

The most fundamental point to be raised in relation to the book's basic argument, however, concerns the definition of aggression adopted by the author. He acknowledges the difficulties involved, referring to it as a "portmanteau term which is fairly bursting at its seams." Yet the meaning attached to the term here can hardly be wider, and as one goes through the book one is impressed by the greater and greater range of phenomena encompassed. Thus Storr rejects the conventional definition of aggression as a tendency to inflict harm, and then proceeds to widen it to such an extent that at various points it appears under the guise of exploratory drive, Adler's striving for perfection, and even (following Winnicot's characterisation of infant development) as synonymous with activity. Used in this way the term appears to connote almost anything that involves effort (perhaps White's concept of competence represents most closely what Storr has in mind), but such an extension of meaning makes the term almost completely useless. No wonder he can ascribe positive functions to aggression and then make such extravagent claims as that the aggressive drive serves to preserve and define an individual's identity, that it provides the motivational basis for the mastery of intellectual problems, and that it is responsible for the child's growing independence of his parents. The argument has thus become a circular one : aggression is arbitrarily defined to suit the author's purposes so that he may then proceed to demonstrate that its true functions are indeed of this nature.

In a final chapter Storr bravely tackles the problem of how to bring about a reduction of hostility. Again he unfortunately does not adopt a developmental point of view, and while some of his suggestions, such as the need to control over-population, are sound though hardly original, others are trifling and unconvincing (in particular his advocacy of a universal language, apparently derived from his observation of a distinguished scientist whose underlying paranoia emerged every time he crossed the Channel and found himself surrounded by people he could not understand). Also his idea for more international competitions as a way of draining off aggressive energy into safer areas of conflict is unlikely to convince anyone conversant with the furies and passions of international football.

Storr has produced a stimulating book on an important topic and must be congratulated for his courage in attempting to unravel its complexities. It is a measure of these complexities that even such a thoughtful writer has not succeeded in bringing us nearer to a real understanding of the nature of human aggression.

H. R. SCHAFFER.

TOD, R. J. N. (Ed.) (1968). *Papers on Residential Work—Volume 1—Children in Care ; Volume 2—Disturbed Children.* London ; Longmans, Green and Co., pp. 115 and 132, 12s. 6d. each.

These two companion volumes contain a collection of articles, related to the care of children in children's homes and residential schools, which have appeared in British and American journals within the last 13 years. The papers in the first volume deal mainly with the child's reaction to separation from his family and with the management of children, individually and in groups, in the residential setting ; the second book is devoted to articles concerned with the care and treatment of maladjusted children in homes and boarding schools.

It is doubtful whether this mixed bag of articles, loosely if skilfully linked by brief editorial comment, makes a substantial contribution towards the " rationale of residential care and treatment of deprived and disturbed children " which the editor states is urgently needed for those who have the complex task of combining both professional and personal roles in their daily contact with children. However, the papers are well-chosen in that they all have something of value to say, they are clearly written and, for the most part, jargon-free. With so many contributors, different articles will appeal to different readers, and it is difficult to pick out papers for special mention, though the two contributions by Gisela Konopka and the paper on the consequences of separation by Gordon Trasler may be considered of particular

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" n.p." means " no price stated."

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SIR FRED SCHONELL

Professor Sir Fred Schonell was born in Perth, Western Australia, in August, 1900. He was educated at Perth Modern School and the University of Western Australia, and was one of the first of the University's graduates to be awarded a Hackett overseas studentship. He studied educational psychology at King's College, London, and at the University of London Institute of Education, from which he took his Ph.D. Degree. He was lecturer at Goldsmiths' College, London, from 1931 to 1942; Professor of Education, University College, Swansea, from 1942 to 1946; Professor and Head of the Education Department, University of Birmingham, from 1946 to 1950. In 1950 he returned to Australia as Professor of Education and Dean of the Faculty of Education in the University of Queensland, where he was subsequently appointed to the Vice-Chancellorship in 1960. He was knighted in 1962.

Sir Fred came into the field of psychology at a time when formal work on test construction and utilisation was at the forefront and, with his wife, he determined to use this knowledge in the service of the less able children. He researched widely in the fields of Arithmetic, Reading and Spelling and wrote books and articles designed to help teachers in both diagnosis and remedial work. He founded the Remedial Centre in the University of Birmingham, and in later years, modelled the Queensland centre on it. He was one of the few who could combine on-the-spot experience with the sound rigours of intellectual scholarship; his work was a superb blend of the practitioner and the philosopher, of the teacher and the psychologist. Much of the work pioneered by him provides a strong base for remedial teaching today.

D.M.L.

VOLUME 39 JUNE 1969 PART 2

PERSONALITY IN PRIMARY SCHOOL CHILDREN:

1.—ABILITY AND ACHIEVEMENT.

BY H. J. EYSENCK
(*Institute of Psychiatry, London*)

AND D. COOKSON
(*Child Guidance Centre, Lichfield, Staffs.*)

SUMMARY. Scores of some 4,000 11-year-old boys and girls on the JEPI were analysed in relation to performance on scholastic and ability tests at the primary school leaving age. Analysis by correlation and analysis of variance methods revealed that extraverted boys and girls are scholastically superior to introverted ones, the regression being linear; that stable boys and girls did only marginally better than unstable ones, the regression being somewhat curvilinear; that interaction effects between N and E only occurred in conjunction with sex, unstable extraverted girls doing unexpectedly well, unstable extraverted boys unexpectedly poorly. Grammar school entrance proportions favoured extraverted and stable boys and girls, and disfavoured 'liars' on the L scale. Personality determined performance on ability/achievement tests more closely in the case of girls than of boys. The results suggest the importance of personality variables, particularly extraversion/introversion, in the attempt to predict scholastic success; it seems likely that introverts are 'late developers' as compared with extraverts, but in the absence of proper follow-up studies this conclusion remains speculative.

I.—INTRODUCTION.

THERE has been a resurgence of interest in recent years in the investigation of temperamental variables in relation to scholastic achievement. The discovery that intellectual ability is only one of the determinants of achievement is not of course all that recent, but the lack of suitable personality tests seemed to channel most research efforts into the cognitive field. The growth of dimensional theories of personality, together with the availability of inventories for the measurement of some at least of these dimensions, has changed the picture, and now we have quite a large series of studies comparing the intellectual status and the scholastic achievements of introverts and extraverts, or stable and unstable children and students. Cattell *et al.* (1966) have gone as far as to suggest that ability, temperament and motivation all contribute something like 25 per cent to the achievement variance, and such far-reaching claims are certainly worth investigating. However, such studies as have been reported have often seemed to give contradictory results; the same personality variable (e.g., extraversion) might correlate positively or negatively with achievement in different samples. Such contradictions lower one's faith in the validity of the findings, and require explanation.

One obvious hypothesis which would serve to integrate much of the evidence available is related to the concept of the 'late developer'; if introverts, say, develop more slowly than do extraverts, then superiority of achievement in extraverts during the first few years of schooling might turn into inferiority during later years. Evidence in favour of this hypothesis is in fact available, and comes out quite clearly even in such early pioneering studies as that of MacNitt (1930). This author studied 964 junior and high school pupils aged 13 and upwards, using a specially constructed introversion inventory; he analysed their average school marks in English, Mathematics Social Science, Physical Science and Foreign Languages and came to the following conclusion: "Those tending towards extraversion receive on the average higher marks than the introverts in Grades VII and VIII; slightly higher marks in Grades IX and X; and lower marks in Grades XI and XII... Those in the introverted group seem to increase their school marks on the average through the various grades, the extraverts' marks remaining on the average approximately the same . . . In general, there is a substantial relationship between introversion-extraversion and average school marks" (pp. 131-132). Taking Social Science as an example, we find correlations with introversion to be —·331 in the youngest group, —·192 in the middle group, and +·380 in the oldest; for English the figures are —·379, —·127, and +·043. Physical Science reaches a value of +·489 for the oldest group, an interesting finding in virtue of Hudson's (1966) suggestion of a relationship between introverted personality traits and preference for science; in line with this possibility is the fact that achievement in foreign languages remains obstinately negative, with a value of —·494 in the oldest group. Not too much should be made of these values, but they do suggest (1) a strong relationship, changing in time, between personality (specifically introversion-extraversion) and scholastic achievement, and (2) a differential direction of this relationship, with introversion predisposing pupils towards scientific achievement, and extraversion predisposing them towards linguistic achievement.

A similar inversion over time appears in the more recent work of S. B. G. Eysenck (1965), who correlated JEPI scores on extraversion with intelligence test scores; this correlation turned from positive at age 11 (·22 for girls, ·27 for boys) to negative at age 14 for girls (—·25) and at age 15 for boys (—·10). Intelligence and achievement are of course two different concepts, but it should be remembered that intelligence tests in schools are often highly contaminated with knowledge, and are thus measures of Vernon's *v-ed* factor rather than of *g*. Other recent studies, mostly using either the Junior MPI or EPI, or else the Cattell scales, have also tended to find positive correlations between achievement and intelligence, on the one hand, and extraversion, on the other (Jones, 1960; Morrison *et al.*, 1965; Ridding, 1967; Rushton, 1966; Savage 1966); the children investigated were on the whole quite young. Thus, the evidence, while not unanimous, does seem to support the superiority of extraverted children in the primary school and at the beginning of the secondary school.

As regards the other main personality dimension studied in several researches, emotionality or neuroticism, the findings tend to suggest that among children high N scores are associated with poor performance (Butcher *et al.*, 1963; Callard and Goodfellow, 1962; Hallworth, 1961; Lunzer, 1960; Entwistle and Cunningham, 1968). These generalizations tend to break down when attention is turned to university students (Holmes, 1960; Furneaux, 1962; Lynn, 1959; Kelvin *et al.*, 1965); these tend to excel when high on introversion and on neuroticism. However, students are clearly a very unusual and highly selected sub-group, and should not necessarily be expected to show similar relations between personality and achievement to school children who tend to be quite unselected. Students must, by definition, have passed successfully through a long series of tests, weeding out those whose N component acted as a hindrance rather than as a motivational variable. In school children no such weeding-out process is likely to have taken place.

In view of the considerable amount of agreement which has become apparent in the relation between personality and achievement, it may seem superflous to carry out and report yet another study of a similar kind. There are several reasons for believing that such a study might produce useful results; these reasons are related to certain weaknesses in design characteristic of several past studies. These may be briefly listed. (1) Boys and girls may show quite different regressions of achievement or ability on personality variables, yet very little attention has in fact been paid to this point. (The recent study of Entwistle and Cunningham, 1968, supports this argument, and emphasises the need for treating the sexes separately.) (2) Sampling has not always been very thorough; usually just one or two schools have been used, although it is known that schools often differ profoundly from each other, and may give rise to quite different relationships in characteristics measured. (3) Statistical treatment has usually been very simple; mostly product-moment correlation coefficients have been reported. The underlying assumption of linear regression may not be justified; no tests for curvilinearity have been reported in most of the studies consulted. (4) The personality variables studied have usually been treated in isolation; this is not justified unless it can be shown that no interaction is in fact taking place. Suppose that neurotic introverts and stable extraverts do particularly well on achievement tests; simple tests against N or E separately will not disclose any significant correlations. There are too many examples of such interaction in the experimental literature (Eysenck, 1967) to allow us to dismiss this possibility as fanciful. Some form of zone analysis is clearly called for.

It is with these thoughts in mind that the experiment reported here was initiated; the set-up and the analysis were dictated by the hope that more detailed study of such factors as sex or personality interaction might reveal interesting new facts additional to the expected positive correlation between achievement and extraversion, and the equally expected negative correlation between achievement and neuroticism. Our achievement variables contain, in addition to intelligence (verbal reasoning), the English and Mathematics papers of the 11+ examination and the success or failure of the pupil to gain access to a grammar school: this seemed of some interest in view of the prevailing lack of knowledge of the degree to which personality may influence selection. Reading ability is another achievement which is of obvious importance in connection with school work, and was consequently included.

II.—The study.

Subjects. All schools in Staffordshire with fourth-year junior children were asked to take part in the research. Of those that agreed to do so, 206 with about 6,000 fourth year children participated in all parts of the study and a further 55 with some 1,500 children participated to a more limited degree. In all about 77 per cent of all the 9,750 children in the age group were involved to some extent and all types of rural and urban areas within the county were well represented. At the time the research was done the children ranged in age from 10 years 9 months to 11 years 9 months, and all children in this age group from each school that took part were included.

General Procedure. The measuring techniques and instruments used in the research were investigated in a pilot study, but the carrying out of all parts of the main investigation, all scoring and all recording and dispatching of result was left entirely to the individual schools, each of which received a detailed manual of instructions and information, The data were collected during May, June and July, 1966, and the schools were allowed to administer the tests, etc., at any convenient times during this three months period, although certain stipulations were made regarding conditions of testing and the order in which various tests were to be carried out.

Main Measuring Techniques and Instruments.

The Junior Eysenck Personality Inventory. The most important measuring instrument for the purpose of the present analysis is the Junior Eysenck Personality Inventory (S. B. G. Eysenck, 1965), which was designed to measure the personality dimensions, neuroticism or emotionality and extraversion/introversion, and which also has a Lie Scale.

The children were asked to read the instructions on the test form, and additional oral explanations, mainly for the benefit of the duller children. were also given. They were not allowed to talk to each other about the questions, and no help was given with reading or in explaining the meanings of words or phrases. Teachers were asked to exclude those children who were unable to read the inventory.

The completed forms were checked to make sure no child had left out any item or had made some other error.

Abilities and Achievements. Already available were the results of two Moray House tests of verbal reasoning, one of Mathematics and one of English, taken six months earlier as part of the secondary selection procedure. For each test obtained marks are converted to ' quotients,' which are standard scores with a mean of 100 and a standard deviation of 15. It was also known whether or not a child had qualified for a grammar school place.

Reading level was measured by the Schonell Graded Word Reading Test (Schonell and Schonell, 1960) which is administered individually. Only the obtained score, which is the number of words correctly read, was used in the analysis, although it is usually converted to a Reading Age when the test is used by schools.

*Personality Ratings.** The four personality traits for which the teachers made ratings were: Emotional Stability, Perseverance, Sociability and Impulsiveness. For each trait there were five scale categories, ranging from 1 (highest) to 5 (lowest), and each category was accompanied by a description of children's behaviour or attributes considered most relevant to that level. The teachers were given the rough proportions of children expected in different categories, with a view to obtaining approximately normal distributions. Every child was rated on one trait before any child was rated on the next.

*Family Background.** Information on size of family and ordinal position in the family was obtained from the children. The classification of occupations used (Central Advisory Council for Education, 1954) is based on the Registrar-General's classification into social classes and has five categories, ranging from professional and magerial occuaptions (1) to unskilled occupations (5). Teachers were asked to find out from each child the occupation of his father or guardian.

Teachers rated the degree of interest in their child's progress shown by parents on a four-point scale from 1 (highest level of interest) to 4 (lowest). With each scale category was a description of parental attitudes considered appropriate at that level.

---

* These variables will be analysed and discussed in later papers,

Summary of Main Variables.

Junior EPI	Extraversion (E) Neuroticism (N) Lie Scale (L)
Abilities and Achievements	Verbal Reasoning (Tests 70 and 71) Mathematics English Reading Grammar School pass/fail
Personality Ratings	Emotional Stability Perseverance Sociability Impulsiveness
Family Background	Size of family Ordinal position in family Occupational Classification Parental interest in child's progress.

Method of analysis.

On the basis of the distributions of N, E and L scores, a sample was selected for the purpose of an analysis of variance. As a first step all children with L scores over 8 were excluded. An attempt was then made to divide the two distributions (E and N) into thirds, in such a manner that a maximum number of cases should be included in each of the resulting 9 groups, for both sexes. The two sets of scores finally adopted were as follows: Low N, 0–11. Average N, 12–17. High N, 18–24. Low E, 0–15. Average E, 16–18. High E, 19–24. In this way we obtained, for the two sexes separately, 9 groups of children showing all possible combinations of low, average or high N, and low, average or high E. The number of cases in each of the 2×9 cells was 160, as a minimum, up to 182, as a maximum; the actual number used varied according to the availability of the achievement scores for the particular children involved. Thus the total number in a given analysis was never smaller than 2,880, and never larger than 3,276. In any particular analysis the number of children in each cell was of course kept constant. The reason for the marked variation in numbers was of course that if one child failed to complete his English test say, then 17 other children had to be dropped from the analysis in order to keep numbers in the cells equal. While these analyses of variance constitute the main part of our results, correlational analyses were also carried out on rather larger numbers in order to obtain data from non-selected groups; the analysis of variance group is of course highly selected, although preserving in its main features the characteristics of the total population.

III.—RESULTS.

Verbal Reasoning. Two tests of verbal reasoning were given, VR 70 and VR 71; both were very similar and both are relatively orthodox measures of verbal intelligence. For the purpose of simplicity we shall refer to the scores on these tests as measures of intelligence, without wishing to beg any of the many questions raised by this term. An analysis of variance was carried out on the data from VR 70; these, it will be remembered, formed a $2 \times 3 \times 3$ design, with 2 sex groups, 3E groups and 3 N groups. The means for these various groups are given in Table 1. Sex, as expected, produces significant differences (girls higher) at better than the ·01 level of probability. E produces even more significant differences ($p < \cdot 001$), with the more extraverted having higher scores; this effect seems to be linear. N produces effects which are barely significant ($p < \cdot 05$); the most stable having slightly higher scores than the other two groups. None of the interactions are significant; thus the main effects can be evaluated without regard for possible cross-influences.

TABLE 1

SCORES ON VR 70.

	Male				Female			
	N—	A	N+	All	N—	A	N+	All
I	92·98	91·43	92·19	92·20	94·64	90·98	94·94	93·52
A	96·55	92·60	94·09	94·41	98·20	95·43	95·80	96·48
E	97·73	99·05	92·92	96·57	101·54	99·34	100·18	100·35
All	95·75	94·36	93·07	94·39	98·13	95·25	96·98	96·78

I=introverts. A=ambiverts, E=extraverts. N—=stable. A=average.
N+ =emotionally unstable.

Results for VR 71 are shown in Table 2. Sex again plays a very significant part ($p < \cdot 001$), as does E ($p < \cdot 001$), but N is not significant. However, the $N \times E$ interaction is significant ($p < \cdot 05$). as is the $S \times N \times E$ interaction ($p < \cdot 01$). The sex and E differences go in the same direction as before, i.e., girls and extraverts are superior. The significant interactions appear to originate with the emotional extravert groups; for the girls, this group is the second highest (score 103·90), while for the boys this group is near the bottom (score 95·48). A similar difference actually appears in VR 70 also (100·18 as compared with 92·92), but is below the level of significance. This group occupies the position of psychopaths and prospective criminals in Eysenck's scheme (1964, 1967) and it seems possible that for boys (whose criminal propensities are well known to be much higher than those of girls) this combination of personality traits is more lethal, and interferes more with the massed practice involved in traditional intelligence tests (Eysenck, 1959), than in girls. However, before seeking too earnestly for an explanation of the finding it might perhaps be wise to replicate the findings itself; the failure of the interactions to achieve significance in the VR 70 study suggests caution in accepting the results as necessarily genuine. Some support is given by the significant sex × E interaction found by Entwistle and Cunningham (1968) in their work with 13-year-old school children.

TABLE 2

SCORES ON VR 71.

	Male				Female			
	N—	A	N+	All	N—	A	N+	All
I	95·80	94·45	95·09	95·11	98·78	94·25	98·31	97·11
A	99·35	95·46	103·15	99·32	101·96	99·64	98·68	100·09
E	101·21	102·26	95·48	99·65	105·44	103·84	103·90	104·39
All	98·79	97·39	97·90	98·03	102·06	99·24	100·30	100·53

Mathematics. The results of the mathematics examination fail to show any difference between the sexes; the often documented superiority of males in dealing with figures apparently just makes good their inferiority in the verbal reasoning tests. (This explanation can be tested by looking at the English marks of the two sexes, where the girls should be very superior according to this hypothesis.) No differences are apparent, either, for N as a main effect, but E is again involved in producing marked differences in achievement ($p < \cdot 001$) $N \times E \times S$ and $S \times N \times E$ interactions are both significant at the $p < \cdot 01$ level. The detailed results are given in Table 3.

TABLE 3

SCORES ON MATHEMATICS TEST.

	Male				Female			
	N—	A	N+	All	N—	A	M+	All
I	91·08	90·79	91·70	91·19	92·93	87·88	92·76	91·22
A	96·28	91·81	100·11	96·06	95·81	94·46	93·59	94·62
E	98·52	99·32	92·96	96·93	99·85	98·36	97·60	98·60
All	95·29	93·98	94·92	94·73	96·20	93·60	94·65	94·81

The interaction effects are again mainly due to the extraverted, emotional children; the girls in this group do well, the boys poorly, compared to their colleagues in the other groups. It may be surmised that this result is either due to lower intelligence in the male sub-group, or else to the reactive inhibition produced in the examination-taking situation when confronted with massed practice on relatively monotonous material.

English. The results for this test are given in Table 4; as far as sex is concerned they bear out our expectation that girls would be very superior to boys ($p < \cdot 001$). The other results are identical with those found in the Mathematics paper; N is significant, E highly significant ($p < \cdot 001$), and the $N \times E$ and $S \times N \times E$ interactions are significant at the ·01 level. Extraverts do better than ambiverts or introverts, and the interaction seems largely due to the emotional/extravert group, with the girls having good scores and the boys bad ones.

TABLE 4

SCORES ON ENGLISH TEST.

	Male				Female			
	N—	A	N+	All	N—	A	N+	All
I	90·85	90·63	92·23	91·23	95·71	92·48	96·67	94·95
A	95·71	91·76	100·89	96·12	98·44	97·78	95·87	97·36
E	97·53	99·21	92·49	96·41	103·42	101·28	100·62	101·77
All	94·70	93·87	95·20	94·59	99·19	97·18	97·72	98·03

Reading. The reading test score again shows the familiar pattern, with girls superior ($p < \cdot 001$) and extraverts superior ($p < \cdot 001$); N shows a significant main effect ($p < \cdot 05$) and a very significant interaction with E ($p < \cdot 001$.) The detailed results are shown in Table 5. The N main effect would appear to be a curvilinear one, with N+ and N− groups having higher scores than A (average) groups. This effect is in fact universal in all our tests, although it is not usually significant; inspection of the VR tests and the Mathematics and English will demonstrate this general tendency quite clearly. It would be idle to speculate at this point about the possible reasons for this curvilinear trend which in any case, while statistically significant over such a large number of children, is effectively very weak and of little practical importance.

TABLE 5

SCORES ON READING TEST.

	Male				Female			
	N−	A	N+	All	N−	A	N+	All
I	54·29	54·70	61·01	56·67	58·77	59 42	63·16	60·45
A	66·15	59·75	62·17	62·69	65·94	64·15	63·53	64·54
E	67·08	66·56	66·87	66·84	71·38	70·09	70·57	70·68
All	62·51	60·34	63·35	62·07	65·37	64·55	65·76	65·23

Grammar School Entrants: *Proportions*. Table 6 lists the proportions of grammar school entrants for the different personality configurations. Both E and N are highly significant ($p < \cdot 001$), while sex and all interactions are non-significant. Extraversion is a favourable sign for grammar school selection (particularly among the girls, it would appear) and neuroticism/emotionality is an unfavourable sign (again the differences are somewhat larger among the girls than among the boys.) The differences are not only statistically significant, but they are clearly of practical importance; the low E—high N girls send 9 per cent to the grammar school, the high E—low N girls 25 per cent. It would be idle to deny the importance in this connection of personality traits, even though some of the variance is presumably mediated through the connection between E and ability/achievement.

TABLE 6

PROPORTIONS OF GRAMMAR SCHOOL ENTRANTS IN DIFFERENT GROUPS.

	Male				Female			
	N−	A	N+	All	N−	A	N+	All
I	·1538	·1264	·1593	·1465	·2198	·0934	·0934	·1355
A	·1758	·1209	·1264	·1410	·2198	·1319	·1209	·1575
E	·2088	·1593	·1923	·1868	·2527	·2637	·2308	·2491
All	·1795	·1355	·1593	·1581	·2308	·1630	·1484	·1808

Correlational analysis. Product-moment correlations were computed between variables discussed above, for altogether 2,162 girls and 1,869 boys. The correlations are given in Table 7 ; values for boys are set out below the leading diagonal of the matrix, values for girls above. The values in the two halves are reassuringly similar, showing that conclusions can with confidence be drawn from them, and that what is true of boys is equally true of girls. With numbers as large as these, correlations in excess of ·04 would be statistically significant, although of course not much psychological importance would be attributed to such very low coefficients.

TABLE 7

INTERCORRELATIONS OF SELECTED TESTS.

		1	2	3	4	5	6	7	8	9	10
1	Age		·06	—·03	—·04	·06	·05	—·05	—·03	—·05	—·01
2	E	·07		—·21	—·03	·22	·19	·18	·19	·19	·07
3	N	—·03	—·19		—·29	—·06	—·11	—·11	—·11	—·10	—·09
4	L	—·06	—·03	—·28		—·17	—·15	—·15	—·13	—·15	—·08
5	Reading	·06	·23	—·06	—·16		·77	·74	·70	·76	·48
6	VR 70 ..	—·05	·19	—·11	—·15	·77		·94	·88	·85	·68
7	VR 71 .	—·05	·19	—·11	—·14	·74	·94		·90	·84	·69
8	Maths...	—·04	·20	—·11	—·12	·70	·87	·89		·78	·64
9	English	—·04	·19	—·10	—·15	·81	·90	·89	·82		·61
10	Grammar school .	—·01	·08	—·09	—·07	·48	·67	·68	·63	·65	

(Boys lower part, girls upper part of matrix.)

Age has been included in the table for the sake of interest, although of course the variance was very small. Nevertheless, there is a slight positive correlation with E and a slight negative one for N, both in line with the general age trend as set out in the Manual of the JEPI. Age also shows a very slight positive relationship with reading, but an even slighter negative one with intelligence and achievement tests ; these are replicated from one group to the other, and must therefore be considered significant statistically. However, the practical importance of these slight values is almost certainly nil, and we will disregard them.

Extraversion, as expected from the analyses of variance, shows positive correlations with the intelligence and achievement tests, ranging from ·23 to ·19 for the boys, and from ·22 to ·19 for the girls. Neuroticism gives smaller but still highly significant correlations with intelligence and achievement tests, ranging from —·06 to —·11 for the boys, and from —·06 to —·11 for the girls. The L scale, interestingly enough, also correlates very significantly with intelligence and achievement tests, values ranging from —·12 to —·16 for the boys, and from —·13 to —·17 for the girls. L does not correlate significantly with E, but does correlate significantly with N (—·28 and —·29 respectively for boys and girls) ; hence one variable could be used as a suppressor variable for the other. Even without doing this, it is clear that the contributions of N and L are additive.

The reading, verbal reasoning, Mathematics and English tests all correlate quite highly together and obviously form the nucleus of a ' scholastic aptitude ' factor ; all these tests show almost identical relationships with E, N and L. The correlation between VR 70 and VR 71 is of course artificially high because it is more of the nature of a reliability coefficient. Grammar school entrance is positively correlated with the scores on this scholastic aptitude factor, but the correlations are much lower than those between the tests; they range from ·48 to ·69, thus leaving over half the variance to be attributed to non-scholastic factors. Personality features appear to play some part in this; entrants are more likely to be extraverted (·08 and ·07 respectively, for boys and girls) and non-neurotic (—·09 for both sexes). In addition low scores on the L scale seem to be regarded with favour; correlations of —·07 and —·08 are found. These correlations are not very high, suggesting that personality as measured contributes only something like 3 per cent to the selection process. This, however, is probably an underestimate; when the figures are corrected for attenuation, as perhaps they ought to be for this purpose, the figure would become somewhat more respectable. Even then, of course, we cannot correct for chance factors in the selection process which probably assume quite a considerable importance, together with home influences and other causes not subject to measurement in this experiment. We would estimate that of the child-contributed variance to the entrance selection procedure, personality factors measured by the JEPI contribute something like 5 per cent to 10 per cent. Such estimates are of course difficult to justify without much more knowledge of all the factors active in the selection process, but they may serve as a base-line on which future research can improve.

Psychological significance. The statistical significance of many of the data reported should not blind us to the fact that with such large numbers of children even quite small differences appear significant, and that, even though these differences appear equally with boys and girls, and are hence replicable, yet their psychological and practical importance may be small. What is required is some yardstick to assess the general importance of observed differences, rather than a measure of statistical significance. A difference in IQ of one point may significantly discriminate between two very large groups, but would be dismissed as unimportant. Where does psychological importance begin, and how can it be indexed? The most obvious index would seem to be some adaptation or other of the method of standard scores, i.e., an indication of the strength of the observed difference in terms of the total variance. In Table 8 we have set out, for boys and girls separately, the ratio of observed differences between extraverts and introverts on various tests to the standard deviation of these tests. It will be seen that for boys this ratio is never below one-third, and exceeds one-half in the case of the reading test; for girls the ratio is in all cases but one in excess of one-half. Thus, if we consider the SD of IQ to be 15, the differences between extraverted and introverted boys would amount to something like 6 points, that between extraverted and introverted girls to something like 8 points. These differences are certainly not unimpoıtant from the psychological point of view, and are larger than the sex differences usually reported, and considered of some interest.

TABLE 8

RATIO OF OBSERVED DIFFERENCES TO SDs OF TESTS FOR EXTRAVERTS *v.* INTROVERTS.

	Boys	Girls
VR 70	·34	·52
VR 71	·33	·52
Mathematics	·40	·50
English	·38	·47
Reading	·55	·55

It is clear that for girls the ratios given in Table 8 are larger than they are for boys. No explanation is offered for this phenomenon, which in any case may not be replicated in future research ; until such replication is reported not too much importance should be attached to this difference. Entwistle and Cunningham (1968) have reported tentatively a similar suggestion.

IV.—DISCUSSION.

To what extent may our sample be regarded as representative ? With respect to verbal intelligence and achievement in Mathematics and English our 1,869 boys and 2,162 girls are not far removed from the national average of 100 ; the figures are given below in Table 9. There is a slight inferiority, but it is too small to give much concern.

TABLE 9

MEAN SCORES ON VR 70, MATHS AND ENGLISH PAPERS.

	Boys	Girls
VR 70................	98·25	98·35
Maths.	98·19	98·20
English	97·75	97·62
(N)	(1,869)	(2,162)

With respect to personality we would perhaps expect considerable agreement between the figures from this sample and the standardization data on extraversion ; the actual figures bear this out. Boys score on the average 17·42, girls 17·42 ; this compares with standardization figures of 17·69 and 17·32 respectively. Variances too are almost identical. In so far as the standardisation sample may be regarded as a proper national sample, so far can we regard our present group as representative. With respect to L we would of course expect our present sample to have lower scores, because high scores were in fact excluded ; the means for our group are 3·86 and 3·86 compared with standardization means of 4·79 and 5·49. Variances are slightly lower, but it is the drop in means which is important and relevant. Concurrent with this drop in L scores, and not unexpected because of the usual negative correlation between L and N, is a rise in N scores. For our group the means are 12·70 and 12·63 ; these figures should be compared with the standardization means of 11·10 and 11·83. Variances are slightly reduced, but the important and relevant figure is the difference in means. Our sample is obviously not representative, containing fewer ' liars ' (high L scorers) and more ' neurotics ' (high N scores). This slight failure to be representative is the price we have to pay for excluding potentially invalid inventories with high lie scores ; it is impossible to be sure whether our choice was or was not a reasonable one. In any case the deviation from proper sampling norms is only a marginal one ; it is unlikely that any of our main conclusions has been much affected by it.

These conclusions may be listed as follows :

(1) Extraverted boys and girls do better scholastically and on verbal reasoning tests than do introverted boys and girls ; the relation is linear on the whole, and may be expressed by a product moment correlation coefficient of ·20 or thereabouts.

(2) Emotional boys and girls do only slightly less well than do stable ones, and the significance of N as a main effect is marginal. The relation is curvilinear, with high N and low N children doing better than those with average N.

(3) Interaction effects between E and N seem to be related to sex; emotional extraverts do well in the female group, but badly in the male group. This result is partly in line with the findings of Entwistle and Cunningham (1968).

(4) Sex differences are apparent in the English paper, but neither in VR nor in Mathematics; the superiority of the girls in English is equalled by their superiority in Reading.

(5) Grammar school entrance proportions favour extraverted and stable boys and girls; instability is actually a worse prognosticator for girls than for boys.

(6) E scores determine performance of girls more closely than performance of boys.

(7) 'Liars' on the L scale tend to be rejected from grammar school entrance; this would of course lower the observed relation between low N scores and acceptance, because of the known negative correlation between N and L. The figures might be more impressive had not very high 'liars' been excluded from the analysis.

These findings present us with some difficult and complex questions. To what extent can we find answers to the casual question implicit in much of what we have said—does intelligence 'cause' extraverted behaviour, or does extraversion 'cause' children to do well in school? We do not believe that our data enable us to answer this type of question, and indeed we are not certain that the question is a meaningful one as phrased. Further research of a more detailed and experimental kind is obviously called for. It is more easily possible to partial out intelligence scores from the personality-achievement correlations, but we have not done this because of doubts about the VR tests being even reasonably pure measures of Burt's "innate mental ability"; their very high correlations with the achievement tests suggest that scholastic achievement makes such a large contribution to VR scores as to make the task of partial correlation analysis of doubtful value. An exception to this general rule is presented by the grammar school entrance data; here clearly we must try and estimate the influence of personality variables when the influence of abliity/achievement is held constant, without however wishing to argue necessarily that the causal sequence goes along this direction. An analysis was undertaken, but will not be reported in detail; it revealed in essence that for most groups the admission rate was governed by ability/achievement, but that introverted boys (but not girls) were accepted more frequently than their VR scores would suggest, and that neurotic boys were selected more frequently, and neurotic girls less frequently, than would be expected on the basis of their VR scores. We do not find it easy to explain these findings. We will come back to these points in a later paper.

Our findings challenge comparison with the Entwistle and Cunningham (1968) paper, which is the only one of those quoted which based its findings on a really adequate number of cases. Working with a sample of 1,472 girls and 1,523 boys aged 13, these authors found a significant, negative, linear correlation between N and school achievement ($r = -\cdot 16$); our own figure is slightly lower and there is a suggestion of curvilinearity in the analysis of variance. Possibly the differences are due to the differences in age of the two samples; possibly the curvilinearity is an artefact of the special selection process used to find equal-sized groups for our analysis of variance. In any case there is agreement on the detrimental effect of N school children, as far as school achievement is concerned. Entwistle and Cunningham failed to find a correlation between school achievement and E "because a distinct sex difference produces an overall non-linear relationship. Extraverted girls and introverted boys tend to be more successful in school work than children with the opposite personality characteristics." We did find a very significant relationship approximating the value of r=·2 between E and school achievement for both sexes ; according to our hypothesis of the introvert 'late developer,' this difference between the two investigations would be explained by the age difference between the two samples. Had a 15-year-old sample been tested we would have predicted an actual inversion of our results, with introverts superior to extraverts. There may of course be a sex difference in the point of cross-over from E-superiority to I-superiority ; Entwistle and Cunningham's data suggest that this point may occur earlier for boys than for girls (but see S. B. G. Eysenck, 1965). Our data agree with Entwistle and Cunningham in suggesting that extraversion is a more positive influence towards school achievement in girls than in boys, although our data emphasise an E×N interaction which does not appear in their data in ours, of the emotional girls it is the extraverted one that does *best*, while of the emotional boys it is the extraverted one that does *worst*. There is no overall curvilinear regression of school achievement on E, for boys and girls together, or for each sex separately, as in their Fig. 2. This interaction effect (N×E) may also be a function of age, disappearing as the children get older.

It is clear that Entwistle and Cunningham are right when they say that we are dealing with "complex inter-relationships about which we still know all too little." The reason why the problem is a difficult one is clearly related to the differential influence of age and sex on personality and achievement ; this makes essential use of very large groups of children, and the coverage of different ages. The present study may serve as an introduction to the analysis of 11-year-old children, while the Entwistle and Cunningham one serves the same purpose for 13-year-old children. A study of 15-year-olds would give us an even better perspective, but of course all this would still only be cross-sectional ; what is most urgently needed is a good follow-up study, on large numbers of children, taking into account school achievement and intelligence, as well as personality and home background. The advantage we now have is simply that we can frame more clear-cut hypotheses than was possible a few years ago ; we are certainly still very far from having any firm answers to our questions.

Some hypotheses have already been suggested by Entwistle and Cunningham, and by us in a previous section ; here we wish merely to point out that the testing of such hypotheses demands a much more analytic approach than has been customary. Eysenck's attempt to make use of the Yerkes-Dodson law in relating achievement in school to N demands for its verification some measure of the *difficulty level* of the school work involved, as this is a crucial parameter of the law in question ; what is more, this difficulty level may differ from school to school, or even from class to class, and will almost certainly differ from pupil to pupil. Without measuring these aspects of difficulty level no proper assessment of the value of the theory is possible. Again, motivation is an important variable which is frequently neglected, although it plays a crucial role in the complex of hypotheses which we are considering (Eysenck, 1964) ; it might with advantage be measured along the lines suggested by Entwistle (1968). Possibly some of the observed differences between extraverts and introverts, and their relation to age, reflect differences in response to social motivation ; this may be stronger in the primary school, to give way gradually to intrinsic scholastic motivation. This shift in turn may occur earlier in England than in the U.S.A., where schools are reputed to present a 'softer' option than in England ; this may account for the later cross-over between achievement and extraversion in the work of MacNitt (1930) than in that of Eysenck (1965).

Some attempt to measure this variable of 'formal work' will have to be made if we wish to test adequately any of the theories which suggest themselves. Complexity in the data does not preclude scientific analysis, but it does demand corresponding complexity of analysis, theory and measurement.

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PERSONALITY IN PRIMARY SCHOOL CHILDREN:

2.—TEACHERS' RATINGS.

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SUMMARY. Teachers' ratings of emotional stability, perseverance, sociability and impulsiveness were compared with ability and achievement scores, as well as with scores on the Junior Eysenck Personality Inventory. Analysis of variance and factor analyses were performed on some 4,000 male and female primary school leavers. The results show complex interrelations between ability and achievement variables, inventory variables, and parental status and other family variables. Teachers' ratings on extraverted behaviour patterns correlated well with inventory responses on the children; teachers' ratings of emotional stability did not correlate well with children's self-ratings, possibly because of concentration of teachers on matters of school discipline and moral behaviour. Grammar school entrance was determined both by ability/achievement and by social status. For both boys and girls the pattern of inter-relations was very similar.

I.—INTRODUCTION.

In the first paper of this series, Eysenck and Cookson (1969) have described the sample of some 4,000 Staffordshire boys and girls used in this study, all of whom were in the last year of their primary school life. Also described in detail in that paper were the tests, measures and ratings used. Here we will only remind the reader that extraversion and neuroticism were measured on the Junior Eysenck Personality Inventory, which also included a Lie scale; that teachers were asked to rate the children on four 5-point scales on emotional stability, perseverance, sociability and impulsiveness (from 1=highest to 5=lowest), and that scores were available on two verbal reasoning tests, one reading test, and Mathematics and English examination results. Also available was information on size of family, ordinal position in family, and parental interest, as well as social status In the first paper we discussed the relationship between abilities and achievement on the one hand, and inventory responses, on the other; for much of the analysis a special sub-sample was used in which equal numbers of children made up the 18 cells created by division into two sex groups, three extraversion groups, and three neuroticism groups. In the present paper we have concentrated on the results achieved by analysing the teachers' ratings in relation to all the other variables.

Previous writers have on the whole not found too much agreement between inventory responses and teachers' ratings (e.g., Sarason *et al.*, 1960; Eysenck and Pickup, 1968), and we did not expect that our data would differ widely from the earlier ones. One of the reasons for this lack of agreement may be found in the divergent views of 'abnormality' held by teachers and psychiatrists, respectively. Wickman (1928), in his classic formulation of the problem, had divergent types of behaviour rated for 'degree of abnormality' by teachers and mental hygienists; he found that "teachers stress the importance of problems relating to sex, dishonesty, disobedience, disorderliness and failure to learn;

For them, the problems that indicate withdrawing, recessive characteristics in children are of comparatively little significance. Mental hygienists, on the other hand, consider these unsocial forms of behaviour most serious and discount the stress which teachers lay on anti-social conduct " (p. 129). Much support has come for this view from the work of Boynton and McGaw (1934), Epstein (1941), Dickson (1932), Harkness (1951), Hildreth (1928), Laycock (1934), McClure (1929), McFie (1934), Mitchell (1943), Peck (1935), Sparks (1952), Stogdill (1931), Thompson (1940), Yourman (1932) and many others ; Hollins (1955) concludes his excellent review of the field by saying " This review of research shows that a change of approach may make a difference as to whether teachers regard violations of morality or school offences as the most serious forms of problem behaviour, but there is overwhelming evidence that they do not regard the introverted, unsocial child as a problem " (p. 22). And his own research suggested that " teachers consider children who violate standards of morality and defy school authority as more seriously maladjusted than those who are quiet and unsociable." Psychiatric social workers " consider the problems of ' withdrawing,' introverted behaviour as the most serious signs of maladjustment " (pp. 2, 3).

In terms of Eysenck's analysis of personality it is clear that teachers regard neurotic extraverted patterns of conduct as specifically abnormal, psychiatrists neurotic introverted patterns (Eysenck, 1960, 1967) ; both are right in what they assert, wrong in what they deny. Both would be expected to show less than perfect agreement with an inventory of ' neuroticism ' which was independent of extraversion/introversion, and a relatively pure measure of maladjustment. Nevertheless, some agreement would be expected, and was indeed found, as we shall see below.

II.—RESULTS.

Emotional Stability. Analysis of variance of the ratings on emotional stability gives highly significant results for all three main effects (sex, E, N) at the $p < \cdot 001$ level. Girls are more stable ; extraverts are more stable ; and children with low scores on N are more stable, in terms of the teachers' ratings. On a 5-point scale the low-N, high E girls have the most stable score (2·63), the high-N, low-E boys have the second-highest score (3·30). Table 1 gives the details ; it will be seen that all the regressions are reasonably linear. None of the interactions are significant.

TABLE 1

RATINGS OF EMOTIONAL STABILITY.

	Boys				Girls			
	N—	A	N+	All	N—	A	N+	All
I	3·20	3·34	3·30	3-28	3·00	3·27	3·16	3·15
A	2·94	3 03	3·15	3·04	2·70	2·95	2·97	2·87
E	2·92	3·07	3·05	3·01	2·63	2·66	2·82	2·71
All	3·02	3·14	3·17	3·11	2·78	2·96	2·99	2·91

Perseverance. For ratings of perseverance, too; all three main effects are significant at the $p < \cdot 001$ level. Details are given in Table 2 ; it will be seen that girls are rated as more persevering than boys, extraverts than introverts, and low-N children than high-N children. None of the interactions are significant, and the regressions are reasonably linear in all cases.

TABLE 2

RATINGS OF PERSEVERANCE.

	Boys				Girls			
	N –	A	N+	All	N	A	N+	All
I	3·34	3·42	3·39	3·38	3·09	3·23	3·18	3·16
A	3·07	3·30	3·25	3·21	2·80	2·90	3·12	2·94
E	3·00	3·07	3·09	3·05	2·55	2·72	2·87	2·71
All	3·13	3·27	3·24	3·21	2·82	2·95	3·05	2·94

Sociability. The results of this rating are given in Table 3; of the main effects only E is significant ($p < \cdot 001$), but there are two significant interactions: $S \times E$ ($p < \cdot 05$) and $N \times E$ ($p < \cdot 05$). Extraverted boys and girls are rated as being more sociable, as might have been expected. The $S \times E$ interaction appears to result from the fact that extraverted girls are rated as considerably more sociable than extraverted boys, to an extent not predictable from the scores of the other groups. The $N \times E$ interaction appears due to the fact that the N+ and N – groups are rated more sociable than the A group when children are introverted, but as less sociable than the A group when children are ambiverted. It is doubtful if these interactions should be taken too seriously; with such large number of subjects even quite small and psychologically unimportant deviations can easily become statistically significant.

TABLE 3

SOCIABILITY RATINGS.

	Boys				Girls			
	N—	A	N+	All	N—	A	N+	All
I	3·15	3·24	3·14	3·18	3·13	3·31	3·04	3·16
A	2·90	2·81	2·93	2·88	3·01	2·87	2·86	2·91
E	2·73	2·70	2·70	2·71	2·62	2·51	2·57	2·56
All	2·93	2·91	2·92	2·92	2·92	2·90	2·82	2·88

Impulsiveness. For this variable, sex and N are significant at the $p < \cdot 001$ level, while E is significant only at the $p < \cdot 01$ level; the interactions are uniformly insignificant. Detailed results are presented in Table 4. Males, as one might have expected, are the more impulsive sex; high N scores, too, are more impulsive. Extraversion goes with impulsiveness; thus the extraverted high-N boys have a score of 2·75 while the introverted low-N girls have one of 3·32. All these differences are in line with expectation.

TABLE 4

IMPULSIVENESS RATINGS.

	Boys				Girls			
	N—	A	N+	All	N—	A	N+	All
I	2·97	3·09	2·93	3·00	3·32	3·25	3·19	3·25
A	3·10	2·81	2·92	2·94	3·41	3·23	3·09	3·24
E	2·91	2·78	2·75	2·81	3·30	3·15	3·15	3·20
All	2·99	2·89	2·87	2·92	3·24	3·21	3·14	3·23

Correlational analysis. Table 5 gives the product-moment correlations between the inventory variables and the ratings; also included are age, intelligence (VR 70) and grammar school acceptance. The values for boys and girls are given separately; there are 1,869 boys and 2,162 girls included in the computations. Correlations above ·04 are statistically significant; this does not of course imply that they are psychologically important or meaningful. The pattern of correlations is very similar for both sexes, thus lending support to any conclusions that may be drawn.

TABLE 5

PRODUCT-MOMENT CORRELATIONS BETWEEN AGE, PERSONALITY VARIABLES AND INTELLIGENCE.

	1	2	3	4	5	6	7	8	9	10
1. Age.		·06	–·03	–·04	·07	·11	·13	–·01	–·05	–·01
2. E	·07		–·21	–·03	·13	·12	·21	·07	·19	·07
3. N	–·03	–·19		–·29	–·08	–·08	–·03	04	–·11	–·09
4. L	–·06	–·03	–·28		–·05	–·07	–·14	–·04	–·15	–·08
5. Emotional Stability. . .	·08	·12	–·09	–·04		·48	·33	–·43	·27	·22
6. Perseverance	·09	·13	–·06	–·09	·48		·29	–·41	·49	42
7. Sociability.	·11	·22	–·02	–·15	·33	·29		·10	·14	·13
8. Impulsiveness	–·01	·06	·05	–·04	–·42	–·41	·10		–·22	–·21
9 VR	–·15	·19	–·11	–·15	·27	·49	·13	–·23		·68
10. Grammar School	–·00	·08	–·09	–·07	·21	·41	·12	–·21	·67	

(Boys lower part, girls upper part of matrix.)

The older children are slightly more stable, persevering, and sociable; it should be remembered, of course, that the age differences are minute in this sample. Consequently the observed correlations, while small, may suggest true relationships when extrapolated over longer periods. Extraversion is correlated with stability, perseverance, sociability and impulsiveness; none of these correlations is very high, but they are clearly replicated for the two sexes. N is correlated with instability, lack of perseverance, and impulsiveness; here again the correlations are replicated for both sexes, but small. High L scores are rated as unsociable and as lacking in perseverance; interpretation of this finding is difficult.

The teachers' ratings themselves are intercorrelated in such a fashion that they suggest a halo factor, particularly when the intelligence test results are also taken into account. Thus intelligence, stability, perseverance and sociability are positively intercorrelated, while impulsiveness is negatively correlated with all these desirable qualities (except sociability, where the correlation is slightly positive).

Grammar school entrance gives quite high correlations with teachers' ratings, although what is cause and what is effect here would be hard to disentangle. It might be argued that to teachers the intelligent, hard-working child acquires a halo which governs their ratings, and that this type of child is also likely to gain entry to a grammar school. Perseverance is the trait most relevant to success in this, while impulsiveness is the major drawback.

Psychological significance. In the first paper in this series, it was suggested that statistical significance is not identical with psychological significance, and that a more useful measure of the latter might be arrived at by indexing the observed differences between introverts and extraverts, or between high and low N scorers, in terms of the SD of the whole distribution of scores. This has been done, and the results are given in Table 6. It will be seen that on the whole results show higher values for E than for N, and for girls than for boys; this latter phenomenon was also found with respect to ability and achievement tests. The absolute size of the values suggests that several of the observed differences are of a size to justify confidence in their psychological significance; two are above one-half, another just below this value, and one is over two-thirds of a SD. These results are a little more positive than the simple correlations given in Table 5; the reason of course is simply that here we are dealing with the more extreme groups, where relations should be more readily apparent.

TABLE 6

RATIO OF OBSERVED DIFFERENCES TO S.D.

	Boys		Girls	
	E	N	E	N
Emotional Stability	·28	·15	·45	·22
Perseverance	·33	·11	·44	·22
Sociability	·56	·01	·71	·11
Impulsiveness	·20	·13	·05	·21

Factor analysis. While the data are not ideally suited to factor analytic treatment, it was thought that this technique of evaluation might throw some interesting light on the findings. Consequently the product-moment correlations for the 17 variables listed in Table 7 were factor analysed by means of the principal components technique, 17 factors being extracted. The number of children involved was the same as listed above under 'correlational analysis.' Latent roots exceeded unity in the case of the first six factors for the boys, in the case of the first five factors for the girls; it was decided to accept the six factor solution in both cases, and to rotate factors, according to the Promax oblique programme (Hendrickson and White, 1964). The results for the boys are shown in Table 7.

TABLE 7

ROTATED FACTORS: BOYS.

		1	2	3	4	5	6
1.	Age	—·19	·05	—·08	—·48	·05	·05
2.	E	·16	—·06	—·30	—·58	—·29	—·03
3.	N	—·06	—·03	—·01	·10	·81	·03
4.	L	—·20	·01	—·14	·25	—·76	·04
5.	Emotional Instability	·11	—·00	·74	·36	·02	—·03
6.	Lack of Perseverance	—·28	—·06	·58	·21	·01	·03
7	Lack of Sociability	·09	—·02	·09	·81	—·13	—·04
8	Lack of Impulsiveness	—·02	—·00	—·85	·27	- ·06	—·02
9.	No. of Children	·01	·92	—·03	—·01	·00	·01
10.	Position in Family	·07	·94	·01	—·04	—·04	—·03
11.	Reading	·87	·03	·07	—·01	·06	—·09
12	Low Occupational Status	—·26	—·00	·03	—·06	·00	·94
13.	Lack of Interest	—·29	·21	·28	·08	·04	·26
14.	VR 70	·98	·03	—·00	·08	·01	—·07
15.	Mathematics	·92	·03	—·01	·05	—·01	—07
16.	English	·98	·02	·02	·10	·02	—·07
17.	Grammar School	·76	—·06	—·08	·02	—·02	—·65

The first factor loads highly on ability, school achievement, and grammar school entry ; there are also some low loadings on E, L (negative), Perseverance, Occupational Status and Parental Interest. The nature of this factor as one of scholastic achievement is hardly in doubt. The second factor is equally clear ; it loads on number in family and on position in family, and is thus a family size factor, with a slight loading on Lack of Interest. Factor three is one of (rated) emotional instability ; it has high loadings on Lack of Stability and Lack of Perseverance, and a high loading on Impulsiveness. In addition there is lack of parental interest, high E scores and low L scores. We will return to this factor again in the discussion. Factor four is one of introversion, with E having a high negative loading, and Lack of Sociability an even higher (positive) one. Lack of Impulsiveness also loads positively on this factor, as does (perhaps surprisingly) age (in a negative direction). Factor five is an inventory neuroticism factor, loading high on N and (negatively) L ; E has a slight negative loading. Factor six, finally, is an Occupational Status factor, with Parental Interest and Grammar School entrance also having positive loadings. It is interesting to note that Grammar School Entrance loads almost as heavily on this Status factor as it does on the Achievement factor ; one wonders whether educationalists would have predicted this pattern of loadings ?

TABLE 8

CORRELATIONS AMONG PRIMARY FACTORS : BOYS.

1·00	—·29	–0·38	—0·31	—0·07	0·10
—0·29	1·00	0·10	0·10	0·10	—0·18
—0·38	0·10	1·00	0·16	0·02	—0·02
—0·31	0·08	0·16	1·00	0·07	—0·12
—0·07	0·10	0·02	0·07	1·00	—0·03
0·10	—0·18	—0·02	—0·12	—0·03	1·00

Table 8 shows the correlations between the primary factors discussed above. School achievement as a factor is negatively correlated with the family size factor, negatively with the emotional instability factor, negatively with the introversion (lack of sociability) factor, and hardly at all with the other two factors. The remaining correlations in this Table are probably too slight to deserve mention.

Table 9 shows the factor pattern for the girls. It will be seen that the first five factors are very similar to those of the boys, with identical tests loading identical factors. (Factor II is reversed in sign, as is Factor V.) The only exception is factor six, whose latent root fell short of unity in any case ; instead of being a status factor, as with the boys, this is clearly an age factor. Instead of constituting a separate factor, the status variable (No. 12) now has considerable loading on the first factor (ability/achievement) ; the loading is ·44, as compared with ·26 for the boys. It is difficult to explain this shift, which may have no clear psychological significance, but may be a statistical artefact. It must be left to future work to decide whether any interpretation is called for. Table 10 gives the correlations between the factors ; these are very similar to those shown in Table 8, and require no comment.

TABLE 9

ROTATED FACTORS : GIRLS.

	1	2	3	4	5	6
1	—0·03	0·05	—0·07	—0·05	—0·01	—0·95
2	0·10	0·06	—0·19	—0·64	0·26	—0·10
3	—0·09	0·03	—0·01	0·20	—0·81	0·05
4	—0·17	—0·12	—0·10	0·16	0·77	0·07
5	0·12	0·03	0·81	0·25	—0·00	0·00
6	—0·28	0·04	0·63	0·12	0·00	0·08
7	0·16	0·09	0·23	0·82	0·16	—0·03
8	0·02	0·04	—0·81	0·41	0·09	—0·05
9	0·02	—0·91	—0·02	0·01	0·01	—0·01
10	0·05	—0·93	0·02	—0·06	0·04	0·07
11	0·86	0·02	0·06	0·01	—0·07	—0·16
12	—0·44	—0·20	—0·02	0·09	—0·02	—0·18
13	—0·26	—0·26	0·31	0·17	—0·03	—0·15
14	0·96	- 0·03	—0·01	0·03	—0·02	0·02
15	0·91	—0·03	—0·02	0·00	—0·00	0·02
16	0·94	0·01	0·05	0·04	—0·02	0·00
17	0·77	—0·10	—0·09	0·08	0·03	0·04

TABLE 10

CORRELATIONS AMONG PRIMARY FACTORS=Girls.

1·00	0·30	—0·39	—0·29	0·01	0·05
0·30	1·00	—0·11	—0·11	0·09	0·12
—0·39	—0·11	1·00	0·16	0·01	0·00
—0·29	—0·11	0·16	1·00	0·02	0·07
0·01	0·09	0·01	0·02	1·00	0·01
0·05	0·12	0·00	0·07	0·01	1·00

III.—DISCUSSION.

The results of this study do not require extensive discussion because they are essentially clear-cut and obvious, as can be seen by considering the factors which emerge from the factor-analysis—ability/achievement, family size, emotional instability, introversion, neuroticism, and occupational status. The only problem raised by this analysis is the apparent separation between neuroticism and emotional instability as two separate factors ; we have already commented in the introduction on the likelihood of ratings by teachers and inventory responses by children on what seem semantically identical variables being poorly related ; this finding bears out our expectation. Introversion on the inventory shows clear relations with teachers' ratings of lack of sociability, lack of impulsiveness, lack of perseverance and also emotional instability. This seems to contradict the expectation, based on the findings of Wickman, Hollins and others that teachers would regard extraverted, outgoing behaviour with its accompanying disturbances as more ' emotionally unstable ' than the less troublesome types of introverted behaviour. Apparently this was not so in our sample, and further research is need to throw more light on the correlates of rated instability and inventory neuroticism respectively.

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THE PROFILE SIMILARITY COEFFICIENT, r_p, IN VOCATIONAL GUIDANCE AND DIAGNOSTIC CLASSIFICATION

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I.—THE ROLE OF PROFILE MATCHING IN DETERMINING 'ADJUSTMENT'

BROADLY, there are two ways of reaching a decision, from a given person's profile on an array of personality and ability traits, concerning what his suitability may be for a particular job, an educational classification, or a clinical diagnostic assignment. They are:

(1) *The Effectiveness Estimate,* where a quantitative value on some criterion of effectiveness (or, negatively, of defectiveness, in the case of a clinical profile) is estimated by a function of the test scores—in most cases a weighted linear composite.

(2) *The Adjustment or Belongingness Calculation,* where a person is assigned more or less to certain discrete types, e.g., that of persons who typically make out in an occupation or who are assigned by a psychiatric judgment to a syndrome group.

Psychometry has dwelt more on the first, but there are advantages and disadvantages to each (Cattell, 1949; Cronbach and Gleser, 1953; Cooley and Lohnes, 1962). Regardless of theoretical considerations, the practising counselor or clinical psychologist is more often forced to the second, by the sheer practical advantage of being able to get the necessary values. As recent surveys of educational prediction (Cattell and Butcher, 1968), using the High School Personality Questionnaire (Cattell, Nuttall, and Cattell, 1968), show, any attempt to reach a decision from combined personality and ability measures has about five times as good a chance of obtaining necessary data for the 'adjustment' as for the 'effectiveness' calculation. For example, in vocational guidance there are only about ten available specification equation values for estimating a criterion of occupational success from primary personality and ability factors. On the other hand, data for the type profile, on the same factors (or, at the very least, for the mean and sigma of the intelligence factor), are available for over 50 occupations (Cattell, 1934; Cattell and Eber, 1968; Fryer, 1932; Harrell and Harrell, 1945).

By making certain statistical and other assumptions (Tatsuoka and Cattell, in press), it is possible to derive an effectiveness-estimating specification equation from an occupational profile of occupationally adjusted persons, but the assumptions are probably not those which a psychologist likes to make if he can avoid them. In fact, instead of making this roundabout use of the data for the effectiveness method, one may prefer to take the given mean profile for the occupation or clinical classification, and use it directly to decide by the 'adjustment to an occupation' or 'belongingness' method. This 'belongingness' judgment has, in fact, been used for a long time by counselors, who have hitherto eyed the individual's personality profile against a number of likely occupational profiles.

It is with the rationale and improved use of this 'adjustment' method that the present paper is concerned. The main psychological assumption is clearly that persons who have been successful enough to stay in an occupation are, in some global sense, ' adjusted ' to it. At the very least, they tolerate it, and it tolerates them. Consequently, any candidate for that class can be evaluated for prospective goodness of adjustment to it by determining the similarity of his personality-ability profile to the mean profile for the class. Although this does not give the positive evaluation of effectiveness in terms of a known criterion of goodness of performance, it is not necessarily a second best to the effectiveness approach as commonly embodied in the psychometrist's linear specification equation. For, as shown elsewhere (Cattell, Coulter, and Tsujioka, 1966), its parabolic form fits the more realistic, non-linear model which assumes that there is an optimum level of each trait for the given occupation. Admittedly, this retains a restriction to one particular non-linear form, but still it can be said that the adjustment calculation is not inferior in principle to the weighted linear composite. Its inferiority has resided rather in the way in which the profile similarity has been judged—by eye or some crude formula—and it is with the improvement of this situation, by use of the profile similarity coefficient, r_p, that the present paper is concerned.

II.—CALCULATING THE RESEMBLANCE OF TWO PERSONS BY r_p.

Quite an array of matching indices and distance functions has been developed in recent years by psychologists and statisticians (Cattell, 1949; Cronbach and Gleser, 1953; Gaier and Lee, 1950; Mahalanobis, 1936; McQuitty, 1963; Osgood and Suci, 1958; Tatsuoka and Tiedeman, 1954) for calculating the resemblance of two profiles. All recognize that the correlation coefficient is an inadequate or misleading indicator of the similarity of two profiles. Without undue digression into that theme, let it be said that r fails because it responds only to the first of three aspects of similarity of two profiles, which are (1) shape, (2) level, and (3) accentuation. It fails even on the first if the direction of scoring of some variables (usually arbitrary) is switched. Space forbids analysis of the relative advantages of these matching indices, but the profile similarity coefficient has several, notably a distribution like r from $+1\cdot0$ to $-1\cdot0$, an independence of metric not possessed by Mahalanobis's D^2, and so on.

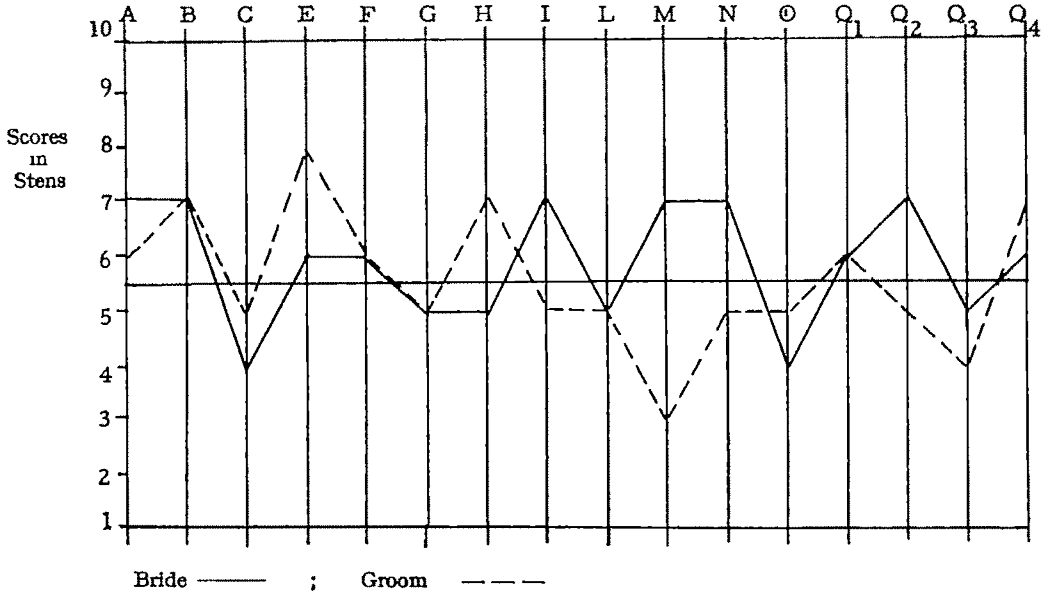
The profile similarity coefficient was deliberately devised (Cattell, 1949) to have these practically useful properties and also to combine all three ' aspects ' of similarity above into a single total judgment. These properties are discussed elsewhere (Cattell, 1949; Cattell, Coulter, and Tsujioka, 1966; Cooley and Lohnes, 1962), and the inquiring reader should also look at the proper relation of r_p to the multiple discriminant function (Tatsuoka and Tiedeman, 1954; Cattell, Coulter, and Tsujioka, 1966). As indicated, one of its appeals to the practitioner is that it ranges from $+1\cdot0$ when two profiles are exactly alike, to 0 when there is only chance resemblance, and so to $-1\cdot0$ when two profiles are as mutually remote as possible.

The simplest use of r_p occurs in evaluating the mutual resemblance of two persons. Since it has been shown (Cattell and Nesselroade, 1967) that happily married couples show more mutual resemblance on sixteen primary personality factors (including intelligence) than those maladjusted in marriage, one might, for example, use it in practice to determine the degree of resemblance of profiles B and G (prospective bride and groom) in Figure 1. The calculation is made by taking the difference (the individual scores being in standard scores or in stens) of the two people on each personality factor (or other set of mutually uncorrelated variables) in succession, as shown by the d's in Figure 1, squaring them and adding them, to give the value Σd^2 in Formula 1.

FIGURE 1

CALCULATION OF PROFILE SIMILARITY OF PROSPECTIVE BRIDE AND GROOM ON PERSONALITY FACTORS.

16 P.F. Personality Factors.



	A	B	C	E	F	G	H	I	L	M	N	O	Q_1	Q_2	Q_3	Q_4
B Bride	7	7	4	6	6	5	5	7	5	7	7	4	6	7	5	6
G Groom	6	7	5	8	6	5	7	5	5	3	5	5	6	5	4	7
d	1	0	1	2	0	0	2	2	0	4	2	1	0	2	1	1
d^2	1	0	1	4	0	0	4	4	0	16	4	1	0	4	1	1
$\Sigma d^2 = 41$																

$r_p = +0{\cdot}50$ (All 16 Elements). $r_p = +0{\cdot}46$ (If only first 14 factors are used).
(Approximate Orthogonality of Factors Assumed.)

The value E (Formula 1) is the chance expected median value of Σd^2, and, if the d's are measured as differences in standard scores, we obtain Formula 2. But if the original scores, and therefore the d's, are in stens, i.e., from individual persons' scores originally on a ten-point scale (with sigma of 2 and mean of 5·5), the value of E is 8k', as shown in Formula 3. In both formulae k' is the median chi square value for k degrees of freedom, i.e., for the number of elements (k) in the profile. (If, on the other hand, standard scores are used, sigma=1·0; E=2k'.) It should be pointed out that this formula applies only to elements that are factors, presumably orthogonal, and it would be quite wrong to use it with any highly correlated variables. However, the justification for using it with slightly correlated factors as an approximation is given below :

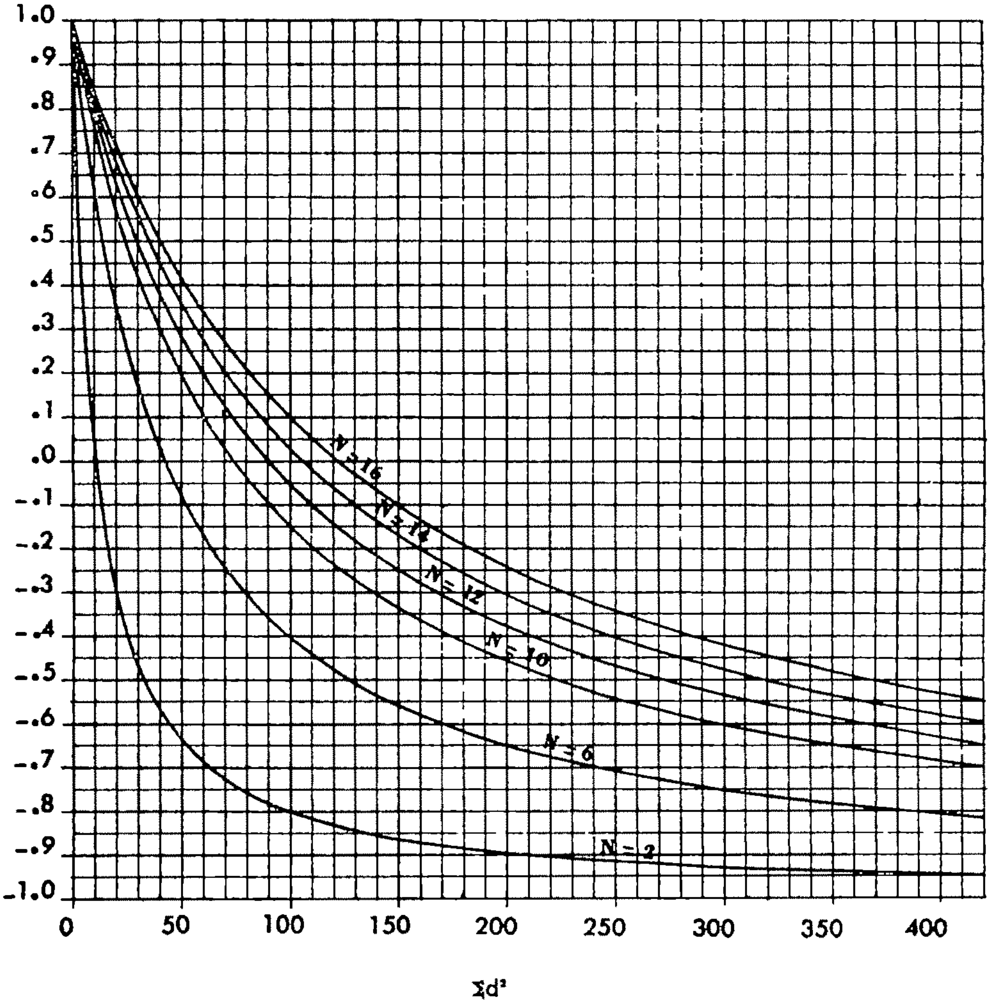
$$(1) \qquad r_{p(i_1 i_2)} = \frac{E - \sum_{i=1}^{k} d_i^2}{E + \sum_{i=1}^{k} d_i^2}$$

$$(2) \qquad r_{p(i_1 i_2)} = \frac{2\,k' - \sum_{i=1}^{k} d_i^2}{2\,k' - \sum_{i=1}^{k} d_i^2}$$

$$(3) \qquad r_{p(i_1 i_2)} = \frac{8\,k' - \sum_{i=1}^{k} d_i^2}{8\,k' + \sum_{i=1}^{k} d_i^2}$$

FIGURE 2

NOMOGRAPH FOR OBTAINING r_p ON PROFILES OF VARIOUS NUMBERS OF ELEMENTS.



In the above instance of the 16 PF, profile, k, the number of elements is 16, and consultation of a table in, say, Ferguson, 1959 (p. 309), shows that k′ is 15·34. However, the user need not go through the arithmetic, since a nomograph can be presented, as in Figure 2 following, from the HSPQ and 16 PF Handbooks (Cattell and Eber, 1968 ; Cattell, Nuttall and Cattell, 1968), whereby fractional r_p values can be read.

In the instance of Figure 1, this shows a resemblance of the prospective marriage partners of $r_p = +0{\cdot}5$ on 16 factors and $+0{\cdot}46$ if we examined them knowing only the first 14 factor scores. Horn (1961) has presented a table of significance tests for r_p reproduced for completeness of usefulness of this article in Table 1 below, from which we should conclude that this couple shows a decided and significant degree of mutual resemblance.

TABLE 1

THE SIGNIFICANCE OF r_p FOR VARIOUS NUMBERS OF ORTHOGONAL ELEMENTS.
(From Horn)

P is the probability of exceeding a given (absolute) value of r_p corresponding to *k* degrees of freedom (Number of profile elements).

	Positive r_p				Negative r_p				Median
k	*P*=·01	·02	·05	·10	·01	·02	·05	·10	X^2
2	·971	·943	·862	·736	—·738	—·699	—·624	—·537	1·386
3	·907	·855	·741	·604	—·655	—·612	—·535	—·451	2·366
4	·837	·773	·650	·519	—·596	—·553	—·477	—·397	3·357
5	·774	·705	·583	·460	—·552	—·509	—·436	—·360	4·351
6	·720	·650	·532	·416	—·517	—·475	—·404	—·331	5·348
7	·673	·605	·491	·383	—·489	—·447	—·378	—·309	6·346
8	·634	·567	·458	·356	—·465	—·424	—·357	—·291	7·344
9	·600	·534	·430	·334	—·444	—·405	—·340	—·275	8·343
10	·570	·507	·407	·315	—·426	—·387	—·324	—·262	9·342
11	·544	·483	·387	·299	—·410	—·373	—·311	—·251	10·34
12	·521	·462	·369	·285	—·396	—·359	—·299	—·241	11·34
13	·501	·443	·354	·273	—·383	—·347	—·289	—·232	12·34
14	·482	·426	·340	·263	—·372	—·336	—·279	—·224	13·34
15	·466	·411	·328	·256	—·363	—·335	—·271	—·217	14·34
16	·450	·397	·317	·245	—·352	—·318	—·263	—·211	15·34
17	·437	·385	·307	·237	—·343	—·310	—·256	—·205	16·34
18	·424	·374	·297	·230	—·335	—·302	—·250	—·200	17·34
19	·412	·363	·289	·223	—·327	—·295	—·243	—·195	18·34
20	·401	·354	·281	·217	—·320	—·288	—·238	—·190	19·34
21	·391	·345	·274	·211	—·314	—·282	—·233	—·186	20·34
22	·382	·336	·267	·206	—·307	—·277	—·228	—·182	21·34
23	·373	·329	·261	·201	—·302	—·271	—·223	—·178	22·34
24	·365	·321	·255	·197	—·296	—·266	—·219	—·174	23·34
25	·358	·314	·250	·193	—·291	—·261	—·215	—·171	24·34
26	·350	·308	·245	·189	—·286	—·257	—·211	—·168	25·34
27	·343	·302	·240	·185	—·281	—·253	—·207	—·165	26·34
28	·337	·296	·235	·182	—·277	—·248	—·204	—·162	27·34
29	·331	·291	·231	·178	—·273	—·245	—·201	—·159	28·34
30	·325	·285	·227	·175	—·269	—·241	—·197	—·157	29·34

Together with median X^2 values for various numbers of elements up to 30.

The choice of factor scores rather than scores on any general set of variables for the psychological elements in the above personality profiles is based (*a*) on the greater psychological meaningfulness of source traits relative to arbitrary scales, and (*b*) on the statistical requirement in the r_p formula that the variables be independent. The former is a matter of psychological taste but the latter is a statistical necessity if r_p is to have its regular properties. If profile elements, e.g., factors, *are* oblique, it is possible to calculate r_p with a more complex formula (Cattell, Coulter, and Tsujioka, 1966) taking account of the matrix of correlations among the variables. But this is time consuming, and our experience suggests that the approximation of the simpler formula is quite tolerable with the usual small correlations among oblique simple structure factors, as in the 16 PF. To the degree that the algebraic mean of the correlations among the oblique factors tends to zero, the correction that would be necessary approaches zero, and with more than about a dozen factors, it seems to be small.

III.—CALCULATING THE PROFILE RESEMBLANCE OF TWO GROUPS.

There are three main kinds of situations in which r_p is needed for reaching a statement of pattern resemblance, (1) between two *individuals*,* as above; (2) between the profiles of two *groups*, each pattern being a mean of all persons in the given group. This occurs in evaluating the similarity of two kinds of delinquency, or of two clinical conditions, or in classifying occupations; and (3) between an *individual and a group profile*, as in vocational guidance or selection where a person is to be assigned to a group.

Use made of r_p in the first situation has generally been sound and nothing beyond the above illustration really needs to be set out. But several instances of usage in the second and third sense have occurred in the literature which are dubious or require some further qualification regarding assumptions. The remainder of the present article aims to help the practising psychologist who is faced with decisions regarding these rather more subtle applications.

A common oversight is to compare the profiles of two groups while still measuring the d's (differences on each factor) in scale scores couched, as usual, in the standard deviation (or sten) units appropriate to individuals rather than groups. The sigma of any trait over groups is, naturally, much smaller than for individuals. The result of such a slip in setting up the calculation is a strongly skewed set of r_p values, due to over-large Σd^2's, giving positive, significant-resemblance where none really exists. The d's should, of course, be expressed in sigma (or sten in the case of Formula 1) units *characteristic of the means of groups* when one is comparing the means of groups. Further, these standard score units, through the use of which the degree of similarity is being calculated, should be those existing among the *particular kind of group* involved, e.g., occupations, clinical syndrome groups. (For example, there is no reason why personality source trait sigmas should be the same among clinical syndrome groups as among occupations). Thus, with elements corresponding to abilities, the means of occupations might be expected to have a larger sigma, than, say, the means of political parties, or of religious sects. On the other hand, in personality factors, the various clinical diagnostic groups might be expected to have larger variance among their means than do occupational groups. Needless perhaps to say, there will also always be differences between the raw score sigmas of the various factor elements in the profile. In the present inadequate development of our science only the coarsest estimates, from a very small N, are yet available for most of these sigmas.

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* Incidentally, 'individual profiles' embraces individual *processes* as well as individual *persons*. Although we are here concerned with individual difference psychology, we should not omit to notice that r_p has application to research in such process studies as perception and learning sequences.

Faced with this dearth of research on the personality and ability factor profiles in the guidance field necessary to provide the sigmas (as well as the target profiles), the practitioner must make the best of a poor situation. He may perhaps be excused for taking the desperate remedy of using an estimate of the variance of occupational means derivable from the assumption that occupations are subgroups taken at random from the general population. In some periods, and with respect to some occupations, this is probably not so far from the truth ! (Blaise Pascal, commenting on the choice of an occupation by the average citizen concluded : " Le hasard en dispose "). To work out a sigma on this choice basis, one might take some mean size of occupational group, say, 40,000, and calculate from the accepted individual variance in that trait, σ_x^2, in the finite population (for the country) the variance for *means* of such occupational groups. Where N_p is the total population size (say 40,000,000 adult employed) and N the average size (say 40,000) of the occupational groups, this can be done by :

$$\sigma^2_{\bar{x}} = \frac{\sigma^2{}_x\,(N_p - N)}{N(N_p - 1)} \tag{4}$$

Such an estimate will err systematically in the direction of being appreciably too small. For, by any sociological and clinical knowledge that we have, occupations and clinical syndrome groups are results of some selection expected to yield smaller than chance *within* group variance and, therefore, larger than chance *between* group mean variances. With occupations, for example, as long as any selection by entrance requirements and job compatibility takes place the incumbents in this occupation will be more selected than people at random. Nevertheless, occupational selection and guidance are, at present, so half-hearted that, except for intelligence, the error in proceeding on this assumption is perhaps not so great, and, at any rate, the *relative* similarities of groups using r_p will be preserved.

Some idea of the size of error on this basis from such an assumption can be gained from the case where it is likely to be largest—intelligence—by utilizing the data for factor B, intelligence, on the 26 occupations in the IPAT 16 PF Occupational Profile Bulletin (1965), and from data (Cattell, 1934) on the mean and sigma of intelligence on 25 occupations gained by a longer intelligence test. The former yields a between group means sigma, in stens of 0·48, and the latter of 1·72. (The sigma in IQ points of this relatively culture fair test (25·0) was, as usual, higher than for traditional tests.) The average within group sigma was of about the same size as the mean of these estimates, 1·10 (stens). Thus, although the sigma within groups is reduced to only about a half the sigma for the general population, i.e., no very strict selection is going on, yet the sigma of the means of occupations is far larger than one would expect from Formula 4 (namely, ·01 stens), on the basis of random selection. Evidently, occupational selection for intelligence is powerful, and, if it is anything like the same for personality traits, some substantial correction needs to be applied to the value obtained by assuming random groups. The situation created by the unsatisfactoriness of this approximation constitutes an argument for pushing ahead strongly with research to determine the *actual* means and sigmas of occupations on the various primary personality factors.*

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* The estimation of the true variance among occupations from samples of 50 to several hundreds, is of course, in any case upset by the smallness of the samples usually taken, and firm data are unlikely to be reliably available for years to come.

IV.—CALCULATING THE PROFILE SIMILARITY BETWEEN AN INDIVIDUAL AND A GROUP.

Somewhat more subtle conceptual problems beset the third situation—the calculation of the resemblance of the profile of an individual to that of a group. Yet this is the most frequently required figure, both by the vocational guidance counselor and the clinician. Two distinct statements of such resemblance are actually possible, with different meanings and calculations.

First, there is what may be labeled the ' group varying ' assumption, and, secondly, the ' group fixed,' or ' fixed criterion ' basis. The calculation according to the first asks : " What is the resemblance of this man to this group profile in terms of the distribution of possible resemblances of all people to all groups ? " That is to say, the outcome of the group varying calculation is that if we work out the r_p's for *all* occupations with respect to *all* people, the r_p's will range from $+1 \cdot 0$ to $-1 \cdot 0$ with a median at 0. From calculations of this kind, one can make such conclusions as, for example, that this man resembles this occupation more than any other ; or that some one occupation has more people ' like ' it than any other ; or that some one man is more fitted for all occupations (sampled) than is another man. (The latter conclusions being reached, of course, by averaging sets of obtained r_p's).

This ' group varying ' r_p will also immediately tell us whether Smith resembles the typical accountant more than most people resemble most occupations, since the latter figure is $0 \cdot 0$. Obviously, this is an r_p of high utility ; but, like the calculation of resemblance of groups, it requires the availability of dependable evidence on the standard deviation of means for the type of group—say occupations—involved. For the method for computing such an r_p must begin by taking the differences between individual and occupation mean, over all factors, in the usual way. They can be either in standard scores, as for Formula (2) above, or in stens, as for Formula (3), but in either case they will be based on the distribution of individuals. However, the distribution and the expected median value, E, in Formula 1 above will now need watching.

If we allow σ^2 to continue to represent the variance of individuals in the population on a given personality factor, and let σ_g^2 be the variance of the means of groups on the given personality factor, then the observed difference between person and group on that element of the profile must be multiplied by $\sqrt{\frac{2}{\sigma^2 + \sigma_g^2}}$ and, similarly for every other element, in order to use $2k'$ as the median expected value, in Formula (2). (This holds regardless of the scale-standard scores or stens—used in the original measures, and Formula (3)—that for stens—is then no longer used.

In the second, or ' group fixed ,' question we ask : " What is the resemblance of this person to the given group mean profile, when an r_p distribution of the usual kind ($+1 \cdot 0$, $-1 \cdot 0$, $0 \cdot 0$) holds for all people in regard to this *fixed* profile ? " In this case, we can even forget that the criterion profile came from group means. It is just some fixed, given, target profile, and could be an abstract ' ideal.'

However, as in the last instance, the expected value, E, in Formula 1 will need to be differently, specially calculated. Let us call d_0 the difference of the individual from the population mean, and D the deviation of the occupation mean from the population mean (both in the ordinary standard scores for individuals).

(5) $$d = d_0 - D$$

(6) $$d^2 = \Sigma d_0^2 - 2\Sigma d_0 D + \Sigma D^2$$

Since the expected value of $\Sigma d_0^2 = k'$, and the expected value of $2\Sigma d_0 D$ is zero (there being a zero correlation of deviations of any random person and any occupation, over all people), the (expected median value) E for $\Sigma d^2 = k' + \Sigma D^2$. (The latter being a fixed value for the given occupation.) If the scores are in stens (two to a sigma), then r_p is calculated as follows :

(7) $$r_{p(ig)} = \frac{(4k' + \sum_{i=1}^{k} D_i^2) - \sum_{i=1}^{k} d_i^2}{(4k' + \sum_{i=1}^{k} D_i^2) + \sum_{i=1}^{k} d_i^2}$$

Again, it is simple to set up a nomograph or table for easy calculation of r_p, and in this one must enter for a ΣD^2 peculiar to the occupation and a Σd^2 specific to the individual, as shown in Table 2.

TABLE 2

READY RECKONER FOR r_p BETWEEN INDIVIDUAL AND GROUP (OR IDEAL) PROFILE FOR 14 ELEMENTS.

		Value of ΣD^2 for the Given Group (Mean) Profile (Taken Against the Population Mean)						
		4	9	13	16	20	26	34
	10	·70	·72	·74	75	·76	·78	·79
	20	·48	·51	·54	·55	·57	·60	·63
Value of Σd^2 for the Individual Against the Group Mean Profile	30	·31	·35	·38	·40	·42	·45	·49
	40	·18	·22	·25	·27	·29	·33	·37
	50	·07	·11	·14	·16	·19	·23	·27
	60	—·02	·02	·05	·07	·10	·14	·19
	70	—·10	—·06	—·03	—·00	·02	·06	·11
	80	—·16	—·12	—·09	—·07	—·04	—·00	·04
	90	—·22	—·18	—·15	—·13	—·10	—·06	—·01
	100	—·27	—·23	—·20	—·18	—·15	—·12	—·07
	110	—·31	—·28	—·25	—·23	—·20	—·16	—·11
	120	—·35	—·32	—·29	—·27	—·24	—·20	—·16
	130	—·35	—·35	—·32	—·30	—·28	—·24	—·20
	140	—·42	—·38	—·36	—·34	—·31	—·28	—·23
	150	—·45	—·41	—·39	—·37	—·34	—·31	—·26
	160	—·47	—·44	—·41	—·40	—·37	—·34	—·29
	170	—·50	—·46	—·44	—·42	—·40	—·36	—·32
	180	—·52	—·49	—·46	—·44	—·42	—·39	—·35
	190	—·54	—·51	—·48	—·47	—·44	—·41	—·37
	200	—·55	—·52	—·50	—·49	—·40	—·43	—·39

V.—THE SIGNIFICANCE OF PROFILE SIMILARITY VALUES.

The statistical significance of r_p has to be considered with respect to two distinct sources of sampling distribution : (1) Sampling over elements of the profile, and (2) Sampling over people. It is well, not only as a practical but as a theoretical matter, that users be reminded of the first. For in much work in this area (and in Q′-technique), it seems to be assumed that the obtained resemblance of, say, two people, is *the* resemblance, whereas in fact, the value will jump about according to the psychological area over which resemblance is measured. It will reach some stability only as the number of elements (variables, factors) used becomes large. The matter is well treated by Horn (1961) whose Table 1 is given on page 135.

Elsewhere (Cattell, Coulter and Tsujioka, 1966), a design for adequate sampling across a stratified modality spread—ability, personality, and dynamic traits—has been discussed. There it is suggested that for individual guidance work, a combination of, say, Thurstone primary abilities, the 16 PF personality factors and the 10 motivation factors found by Horn and Sweney in the MAT (Cattell, *et al.*, 1964), giving about 35 elements, would be a safe basis. As Table 1 shows, considering matters on a purely numerical level, and without regard to psychological spread, an r_p of ·37 is needed for a significance at the $P < \cdot 05$ when one operates with only 12 profile elements.

Regarding the person sampling effect, the question becomes, " If I obtained this r_p between two persons in a sample sized N, between what limits might it lie in the general population with stated confidence ? " The sampling-affected value in the r_p formula can be regarded as the Σd^2, in as much as the sigma on which d is based from a sample is not the true population sigma. If one obtains the confidence limits for Σd^2 at the given N value and substitutes this in the given r_p Formula 1 above, confidence limits for r_p should be calculable, though we shall not pursue the assumptions and issues here.

However, mostly this reference to a general population has not been brought in by users of r_p because resemblance in the *particular sample* of people has been what the researcher has wanted.

VI.—THE USE OF r_p AS A FOUNDATION FOR FURTHER ANALYSES.

Several important further researches and analysis are based on r_p as the initial index. They involve such aims as : (1) comparing the given resemblance to some required standard of resemblance, (2) deriving functions for certain special criteria from it, or (3) using it in company with many other r_p's to discover natural grouping structures in a population. An example of the first is the comparison of Mr. A's resemblance to occupations X and Y with the *average* resemblance of persons in occupations X and Y to those profiles. This operates in the general area of assignment to pre-defined groups by multiple discriminant functions, involving the same notion as in the latter, namely, that the decision rests not on the individual's *absolute* resemblance, but his resemblance *relative* to those obtaining for persons already in the group.

The second, involving the use of r_p in some broader functions, could be illustrated by a probability function for a happy marriage, since we know (Cattell and Nesselroade, 1967) that r_p tends to higher positive values in more stable marriages. But actually we do not yet know the rest of the function in most of these cases. Another, and different, instance is the introduction of systematic weighting of the elements in r_p according to psychological criterion evidence as worked out elsewhere (Cattell, Coulter, and Tsujioka, 1966).

The third use, namely, for clustering individuals in types by Q′ technique, has already had several and varied applications. By applying the Taxonome classification program (Coulter, 1966) to a Q-matrix of r_p's, it has been possible to arrive objectively at national culture pattern groupings (Cattell, 1950) ; at groupings of the 16 PF profiles of neurotics, alcoholics, etc. (Cattell and Scheier, 1961 ; Fuller, 1966) ; and at biological groupings (Cattell, 1968).

Some psychologists have proposed the use of Q matrices of r_p's for *factor* analyses as well as *cluster* analyses, i.e., for Q-technique. Now, although r_p has the advantage over r that it does not (in broad terms) throw away the first factor normally found in R-technique in the Q-technique process, there are some basic problems to be worked out in connection with r_p, operating as it does in a non-Euclidean space, before factor analytic procedures can be applied to r_p matrices. Its use—which is a sufficiently wide and effective one—at present lies more in the fields indicated above.

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THE PERFORMANCE OF SIXTH-FORMERS IN GENERAL STUDIES

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SUMMARY. The performance of groups of candidates on questions selected from the General Studies Advanced Level examination of the Joint Matriculation Board was compared. Four groups defined by the candidates' other Advanced Level subjects were selected : (i) a language-literature group, (ii) a social studies group, (iii) a mathematics-science group and (iv) a science (but non-mathematics) group.

In an analysis of performance on a balanced set of questions cross-classified with respect to content (arts and science) and process (knowledge, comprehension and literacy) the differences among the groups were not statistically significant.

The groups × content × process interaction was significant at the 1 per cent level. In particular, within-group differences in performance on the arts and science comprehension questions were far more prominent in the language-literature and social studies groups. The results are discussed with respect to the validity of examinations of general studies in schools.

I.—INTRODUCTION.

THERE is at present considerable debate on the current pattern of specialization in secondary schools, and particularly in the Sixth Form. But even those who rejoice in the specialist nature of the Sixth Form curriculum seldom claim that a study in depth of two or three related subjects is in itself a complete preparation for higher education. Rather it is argued that these specialist studies should be supplemented by the judicious use of minority time. Thus, the Report of the Central Advisory Council for Education (England) (1959), while commending the emphasis on specialist study, is equally firm in advocating provision for (non-examination) common subjects, taken by arts and science specialists together (e.g., religious education and art), and also for complementary subjects, selected differently for different groups, to further the literacy of the science specialists and the ' numeracy ' of the arts. This line of thought is further developed by the proposal of a group of headmasters—known as the ABC (Agreement to Broaden the Curriculum) proposal—to reserve up to one-third of school time (exclusive of physical education) for their sixth formers' non-specialist studies. It is in the context of such thinking that the role of General Studies needs to be assessed. Recent proposals by the Schools Council for a major-minor pattern of Advanced Level subjects (1966), and alternatively, for the introduction of ' electives ' (1967) favour also the teaching, though not the examining, of General Studies. Little is known however of the success in General Studies of sixth formers of differing specialisms.

The Joint Matriculation Board has conducted an examination in General Studies at the Advanced Level of General Certificate of Education since 1959. Reports on the examination in its early years have been made by Oliver (1960, 1961). The examination is devised on the assumption that all candidates have maintained in the Sixth Form some study of literature and the arts, and also of the natural and social sciences (J.M.B., 1967, 72). The ability to read simple prose in a foreign language is also expected. In 1967 the examination was taken by over ten thousand candidates, this being the Board's largest subject entry at

Advanced Level with the exception of that for English Literature and Physics. It is the performance of samples of candidates selected from this entry which is analysed in this paper.

Preparation for the General Studies examination varies greatly from school to school. Some schools time-table a special course, extending over such fields as literature and the arts, comparative religion, political theory (including national and local government), the history of science and scientific method. Such courses may be taught by two teachers (one arts, one science), or by a panel of up to six. Usually a detailed syllabus is not drawn up, the teachers being encouraged to pursue points of particular interest to themselves. Other schools have no special course, general studies being largely identified with activity in minority time. Thus ancillary courses might be provided—mathematics for biologists, and geology for geographers, for example—and also complementary courses—English and foreign languages for the science specialists and general science for the arts. Again a course in English might be provided for all sixth-formers, excepting only those taking English Literature at the Advanced Level.

There is also no consistent practice as to who is entered for the examination. Occasionally the J.M.B. General Paper (Ordinary Level) is taken first—after one year, sometimes two years, in the Sixth Form—the General Studies (Advanced Level) examination then being taken a year later. Some schools give their pupils a free choice as to whether the examination is taken at all. Others enter all their second-year Sixth, excepting only those with no foreign language qualification, while others enter none. A study of Sixth Form structure now in progress (University of Manchester Department of Education, 1968) shows no difference in the pattern of minority-time usage between schools who enter candidates for General Studies and schools who do not. This suggests that an analysis of the performance of candidates of differing A level specialisms may well have a more general relevance.

II.—SELECTION OF GROUPS.

It was decided not to confine the study to single arts-science comparisons but to compare more homogeneous groups within the broad arts and science fields. Mathematics was the obvious subject on which to define groups of science specialists, separating those who were taking a mathematics subject to the Advanced Level from those who were not. A division for arts specialists was made on the basis of languages. Those offering languages (and of course the corresponding literatures) as a major component of their Advanced Level combination were separated from those concentrating more on social studies. Candidates were therefore classified in four groups (two arts and two science) according to whether their Advanced Level subjects included one or more subjects from the following categories :

(1) A *Language-literature* category (English literature, French, German, Latin, Greek, Spanish, Italian and Russian)—Subject Group A.

(2) A *Social Studies* category (Geography, History, Economics, British Government and Scripture Knowledge)—Subject Group B.

(3) A *Mathematics* category (Pure Mathematics and Theoretical Mechanics, Further Mathematics, Pure Mathematics with Statistics, Pure Mathematics)—Subject Group C.

(4) A *Science* category (Physics, Chemistry, Biology, Botany, Zoology and Geology)—Subject Group D.

Definitions of the groups of *candidates* were then formulated as follows ;

Group 1 : A *Language-literature Group.*

Those who *either* have all or a majority of their A-level subjects (other than General Studies) from Group A with none from Group D, *or*, if they have only two A-level subjects (other than General Studies), one subject is from Group A and the other is not from Groups B and D.

Group 2 : *A Social Studies Group.*

Those who *either* have all or a majority of their other A-level subjects from Group B with none from Group D, *or*, if they have only two other A-level subjects, one subject is from Group B and the other is not from Group D.

Group 3 : *A Mathematics* (*or Mathematics-Science*) *Group.*

Those who *either* have all their other A-level subjects from Group C, *or*, have other A-level subjects from both of Groups C and D.

Group 4 : *A Science Group.*

Those who *either* have all or a majority of their other A-level subjects from Group D with none from Group C, *or*, if they have only two other A-level subjects, one subject is from Group D and the other is not from Group C.

We see that groups so defined are not exhaustive. In particular, candidates offering mixed arts-science combinations with a majority of arts subjects (Groups A and B) are excluded. (Such candidates, however, comprise less than 5 per cent of those taking the General Studies (Advanced) examination in 1967.) On the other hand those with mixed combinations with a majority of science subjects find a place in Group 3, if they offer mathematics, or in Group 4 if they do not. (Group 3 allows for the inclusion of a Group A or Group B subject provided a Group D subject is also included). One exception to the strict application of these definitions was made however. It was decided that Geology taken in combination with Geography should not prevent the combination being regarded as one of social studies with the candidate placed in Group 2.

Random samples of the candidates in the General Studies (Advanced) Summer examination, 1967, of the Joint Matriculation Board were selected to form four groups, as defined above, each of 93, a total of 372 candidates in all. We should note, however, that since science specialists not taking mathematics are far fewer than those who do, the sampling fractions for the two science groups are markedly unequal. There is little difference between the two arts groups in this respect. The sampling fractions are approximately one in 28 for Group 1, one in 29 for Group 2, one in 34 for Group 3 and one in 16 for Group 4.

A study of the particular subjects offered by the groups selected shows that in Group 1 the most popular combination is English, French and History (19) followed by English, French and German (9) and English, French and Spanish (5). In Group 2 the combination of English, History and Geography (17) is the most popular, followed by Geography and Economics (6), History, Geography and Economics (5), and English and History (5). Group 3 is characterized by those taking Pure Mathematics and Theoretical Mechanics, Physics and Chemistry (30) and those taking Pure Mathematics with Mechanics, Further Mathematics and Physics (22) ; while in Group 4 the one combination which dominates all else is that of Physics, Chemistry and Biology (56). In each group most of the candidates take a three-subject combination additional to General Studies (see Table 1). The groups were compared on the basis of the grades attained in their Advanced Level subjects (other than General Studies) and a rough equality of attainment was found.

TABLE 1

NUMBERS OF ADVANCED LEVEL SUBJECTS (ADDITIONAL TO GENERAL STUDIES) TAKEN BY THE GROUPS.

Group	Number of candidates taking				Total
	4 subjects	3 subjects	2 subjects	1 subject	
1	—	79	11	3	93
2	—	61	29	3	93
3	8	77	5	3	93
4	1	72	18	2	93

III.—DESCRIPTION OF QUESTIONS.

The General Studies (Advanced) examination, 1967, consists of two papers, one with an arts and social studies content (Paper I) and the other with a scientific content (Paper II). Both papers, however, contain questions testing (i) basic knowledge (of facts in science or in literature and the arts) and (ii) comprehension (of reading passages). In addition Paper I has two essay questions (on literary—artistic and social studies topics) and Paper II has one (on scientific topics). All the questions can therefore be cross-classified with respect to content (arts and science) and process (knowledge, comprehension and literacy or essay-writing ability).

Paper II also has two questions probing the candidates' ' numeracy,' one on mathematical reasoning and one on the interpretation of data presented in graphical and tabular form. Performance on these questions will be analysed separately from performance on those mentioned above*. A brief description of each question follows.

Paper I, Question 1 (Knowledge: arts).

This consists of 40 objective items (completion, matching and multiple choice) dealing with topics from literature and the arts and from social studies.

Example.

B.....ine, the style of art, especially of architecture, developed in the Eastern division of the Roman Empire.
(Complete the word on the left).

Paper II, Question 2 (knowledge: science).

This is an objective question requiring the matching of two lists. List I contains twenty titles by which scientists working in different fields are known (e.g., cardiologist, meteorologist, neurologist), while list II contains the names of 25 scientific fields (e.g., bones, the earth, mental disorders). Each item in list I has to be matched with one of the items from list II.

Paper I, Question 3 (comprehension: arts).

A passage of some 1,100 words adapted from a preface to a *History of Technology* is provided and 16 multiple-choice items follow.

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* Paper I also has a question on foreign languages (comprehension of reading passages) and Paper II a question on spatial relations (based on an Ordnance Survey map). Performance on these two questions, however, is not considered in this paper.

Example.

The editors use the term *semi-prophetic* (line 9) because they think that :

A although historians record all the facts, they never prophesy what will happen in the future ;

B the facts of recent history are not known to historians ;

C it is not for the editors to advise about how technology should develop in the future ;

D it is very risky to predict events in the development of technology ;

E one cannot know which recent events will be found by posterity to have been most significant.

Paper II, Question 4 (comprehension : science).

A passage of some 600 words describing cooling towers in power stations is provided together with two diagrams illustrating how cooling towers function. Twenty multiple-choice items follow.

Example.

Which of the following statements applies to the *so-called dry system* (line 25), in contrast to the *wet cascade* system (line 26) ?

A Water is not employed for cooling the waste steam.

B Relatively less water is circulating in the cooling system.

C An equivalent amount of water is circulating in the cooling system.

D There is no loss of water by evaporation.

E None of the above.

Paper I, Questions 2 *and* 4 (essays).

In question 2 a choice is required from six topics, all in the field of social studies (e.g., What do you understand by ' nationalism ' ? What should be the relation between state legislation and private morality ?). In question 4 also there is a choice from six topics, these being abstract art, architecture, enjoyment of literature, music, urban renewal and television programmes.

Paper II, Question 1 (essay).

An essay has to be written on one of four topics—the contributions of a scientist or mathematician (of the candidate's choice), the scope and methods of a science (of the candidate's choice), the ' problems of science ' and the development of communication between individuals.

Paper II, Questions 3 *and* 5 (numeracy).

Question 3 consists of ten multiple-choice items on mathematical reasoning. Seven are basically numerical, two are algebraic and one is spatial in content.

Example.

In a football competition among five teams, each team plays each of the other teams once. Two points are given for a win and one point is given for a draw. What is the least number of points a team must have at the end of the competition in order to be *certain* of having more points than at least three of the other teams ?

A 6 B 5 C 8 D 4 E 7

Question 5 is based on a short passage describing activity in a bee-hive. A graph on the rate of egg laying and food consumption during a nine-month period is also provided, together with a table showing the stages of development of a worker bee. Fifteen multiple-choice items on the interpretation of the data follow.

IV.—STATISTICAL ANALYSIS.

The Content-Process Classification : The General Pattern.

Performance on the questions testing knowledge and comprehension in the arts and science fields was considered together with that on the essays. The questions were cross-classified into categories of content—arts and science—and process—knowledge, comprehension and literacy. The marks on the two essays in Paper I were combined to give one literacy-arts mark, the essay in Paper II, providing the corresponding literacy-science mark. All marks were expressed as percentages to facilitate inter-group comparisons across questions of differing maxima.

An analysis of variance was carried out separating the effects of *groups* (of candidates), *content* and *process* together with the three first-order interactions and the second-order interaction among these effects. The main objective was to determine the significance of the interactions. There would be little psychological interest in the main effects of content and process, nor in the content × process interaction, since these effects are based on questions not equated for difficulty. The results of the analysis are recorded in Table 2. The effect of groups, tested against that of individuals within groups, is seen to be of no statistical significance. Group differences in performance over the complete set of questions here analysed are sufficiently small to be deemed due to chance. This is not so, however, when performance on the separate questions is considered. Thus we see that the groups × content × process interaction—which may best be regarded as differences in the content-process interaction from group to group—when tested against the interaction of individuals × content × process within groups (i.e., the residual error term), is significant at the 1 per cent level. The pattern of mean scores for the content-process cross-classifications must then be considered separately for each group.

TABLE 2

ANALYSIS OF VARIANCE (PROCESS-CONTENT).

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Groups (G)	607	3	202·3	<1
Content (C)	175	1	175·0	
Process (P)	95,450	2	47,725·0	
GC	33,180	3	11,060·0	
GP	20,930	6	3,488·3	
CP	81,167	2	40,583·5	
GCP	12,280	6	2,046·7	10·4**
Individuals (I) within G	241,485	368	656·2	
IC, within G	86,732	368	235·7	
IP, within G	190,771	736	259·2	
ICP, within G	145,114	736	197·2	
TOTAL	907,891	2231		

** Significant at the 1 per cent level.

Table 3 shows the ranks of the mean scores for the process-content cross-classifications (the score being ranked within groups) for each of the four groups. Pronounced differences in pattern are evident between Groups 1 and 2, on the one hand, and Groups 3 and 4 on the other. Within both the two science and the two arts groups, however, the pattern of ranks is identical. For Groups 1 and 2 the greatest across-content difference in ranks—a difference of 5—occurs for comprehension, the ranks for the two knowledge and the two literacy categories differing only by one in each case. For Groups 3 and 4 it is the knowledge category that displays the greatest difference across content—a rank difference of 3—the comprehension and literacy categories differing only by one. The ' comprehension ' of the arts candidates, whether specializing in languages or social studies, appears to good advantage only in an arts content—in marked contrast to that of the mathematics and science candidates whose comprehension performances in different contents are more even. On the other hand, it is the knowledge performances of the mathematics and science candidates that are relatively uneven. The across content difference in literacy is seen to be the same (direction apart) in all four groups.

TABLE 3

PROCESS-CONTENT RANKS WITHIN GROUPS.

GROUP		1		2		3		4	
CONTENT	Arts (A) or Science (Sc)	A	Sc	A	Sc	A	Sc	A	Sc
PROCESS	Knowledge	3	2	3	2	4	1	4	1
	Comprehension	1	6	1	6	2	3	2	3
	Literacy	4	5	4	5	6	5	6	5

Performance on the Separate Questions.

It is evident that general conclusions in terms of either content or process are not possible. Rather, group differences must be assessed separately for each of the questions. The mean scores of the groups were therefore obtained for each question, and the significance of differences among these means investigated *via* the F ratio. If significance was established, analyses of particular differences were made in accordance with the procedure advocated by Tukey (1949).

Paper 1, *Question* 1 (Knowledge : arts).

The mean and standard deviation of the scores received by the four groups on this question (marked out of a maximum of 40) are as follows : Group 1 : Mean 23·50, SD 5·74 ; Group 2 : Mean 22·76, SD 5·96 ; Group 3 ; Mean 20·15, SD 6·50 ; Group 4 : Mean 18·72, SD 5·63. The differences (overall) among the means are significant at the 1 per cent level (F=13·1 for 3 and 368 degrees of freedom). The difference between the means for Groups 2 and 3 is significant at the 5 per cent level, but no other difference between adjacent means attains a significance at this level We conclude that Groups 1 and 2 display a real superiority in performance over Groups 3 and 4.

Paper II, *Question* 2 (Knowledge : science).

The mean and standard deviation of the scores of the groups on the corresponding science question (marked out of 20) are shown below. The groups are set out in descending order of mean score. Group 4 : Mean 15·24, SD 2·66 ; Group 1 : Mean 12·98, SD 3·03 ; Group 3 : Mean 12·95, SD 3·19 ;

Group 2 : Mean 12·24, SD 3·31. The differences among the means are significant at the 1 per cent level (F=14·77 for 3 and 368 degrees of freedom). Tukey's procedure shows the gap between the means for Groups 1 and 4 to be significant at the 1 per cent level, with the means for Groups 1, 2 and 3 showing neither a straggler nor excessive variability. Thus the performance of Group 4 stands out as superior, no real differences being indicated among the performances of Groups 1, 2, and 3.

Paper I, *Question* 3 (comprehension : arts).

The mean and standard deviation of the scores of the groups on this question (marked out of 16) are as follows : Group 1 : Mean 11·01, SD 2·71 ; Group 2 : Mean 10·55, SD 2·47 ; Group 3 : Mean 10·25, SD 2·55 ; Group 4 : Mean 9·83, SD 2·48. The differences among the means are significant at the 5 per cent level (F=3·5 for 3 and 368 degrees of freedom). None of the three differences between adjacent means is sufficiently large for significance at this level, and none of the means is a straggler. No firm conclusions about the group differences are possible.

Paper II, *Question* 4 (comprehension : science).

The mean and standard deviation of scores on the corresponding question in science (marked out of 20) are as follows : Group 3 : Mean 12·38, SD 2·89 ; Group 4 : Mean 10·86, SD 2·94 ; Group 2 : Mean 8·76, SD 2·67 ; Group 1 : Mean 7·41, SD 3·14. The differences among the means are significant at the 1 per cent level (F=52·42 with 3 and 368 degrees of freedom). The differences between the means for Groups 1 and 2, and also for Groups 3 and 4, is significant at the 5 per cent level, while that between the means for Groups 2 and 4 is significant at the 1 per cent level. There is then a clear separation of the groups in the order set out above.

Paper I, *Question* 4 (essay : arts).

The mean and standard deviation of the marks received by the groups on the arts essay (maximum mark, 18) are as follows : Group 1 : Mean 9·10, SD 4·72 ; Group 2 : Mean 7·62, SD 4·26 ; Group 3 : Mean 6·77, SD 3·60 ; Group 4 : Mean 6·76, SD 3·52. The differences among the means are significant at the 1 per cent level (F=8·91 for 3 and 368 degrees of freedom). None of the differences between adjacent means is sufficiently large for significance at the 5 per cent level, though the mean for Group 1 is shown by Tukey's procedure to be a straggler. No excessive variability remained among the means for Groups 2, 3 and 4. We may then take the performance of Group 1 as being superior, no real differences being indicated among the performance of Groups 2, 3 and 4. Group differences were apparent, too, in the choice of essay. While one essay, *the enjoyment of literature* (of the candidate's choice), proved the most popular in all four groups, there was a markedly greater spread of choices among Groups 3 and 4. Overall these group differences are significant at the 1 per cent level (X^2=35·51 for 15 degrees of freedom).

Paper I, *Question* 2 (essay : social studies).

The mean and standard deviation of the marks received by the groups for this essay (maximum mark, 18) are as follows : Group 2 : Mean 9·60, SD 3·88 ; Group 1 : Mean 9·48, SD 4·15 ; Group 4 : Mean 7·67, SD 4·07 ; Group 3 : Mean 7·63, SD 3·82. The differences among the means are significant at the 1 per cent level (F=6·94 for 3 and 368 degrees of freedom). The difference between the means for Groups 1 and 4 is significant at the 5 per cent level while the other two differences between adjacent means are not significant at this level. We may conclude that Groups 1 and 2 display a real superiority in performance over Groups 3 and 4. Again marked and significant group differences appear in the choice of essay ($X^2=85\cdot14$ for 15 degrees of freedom).

Paper II, Question 1 (essay: science).

The mean and standard deviation of the marks received by the groups for the science essay (maximum, 18) are as follows: Group 1: Mean 8·72, SD 4·12; Group 2: Mean 8·24, SD 4·12; Group 3: Mean 8·03, SD 3·85; Group 4: Mean 7·83, SD 4·02. The differences (overall) among the means are not statistically significant ($F<1$), so tests for the significance of separate differences are not justified. No real differences in group performance may be claimed.

As to choice of essay, while the most popular choice overall, *the problems of science*, also proved the most popular within each group the choices were more evenly spread among Groups 3 and 4. The group differences of choice are significant at the 1 per cent level ($X^2=52\cdot12$ for 9 degrees of freedom).

Performance on Numeracy.

Performance on the two questions testing numeracy—mathematical reasoning and the interpretation of data—was considered together. This was because an analysis of variance separating the effects of groups, questions and the groups × questions interaction showed this interaction to be statistically insignificant, the mean square for this interaction being less than that for the individuals × questions interaction within groups. The analysis of variance is shown in Table 4. The two questions may be assumed to act in a fundamentally identical manner in distinguishing the groups. We note, too, that the effect of groups, tested against that of individuals within groups is significant at the 1 per cent level.

TABLE 4

ANALYSIS OF VARIANCE (NUMERACY).

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F
Groups (G)	1,745·6	3	581·1	35·0**
Questions (Q)	1,585·2	1	1,585·2	
GQ	6·9	3	2·3	<1
Individuals (I), within G ..	6,120·5	368	16·6	
IQ within G	3,356·8	368	9·1	
TOTAL	12,815·0	743		

** Significant at the 1 per cent level.

The means and standard deviations of the scores of the groups on the two questions combined (maximum mark, 40) are as follows: Group 3: Mean 23·92, SD 5·52; Group 4: Mean 19·96, SD 5·90; Group 1: Mean 16·67, SD 5·49; Group 2: Mean 16·33, SD 6·03. It has been shown (Table 4) that the differences among the means are significant at the 1 per cent level. The difference between the means for Groups 3 and 4, and also for that between the means of

Groups 1 and 4, is significant at the 1 per cent level, while the difference between the means for Groups 1 and 2 is not sufficient for significance even at the 5 per cent level. Thus the performance of Group 3 is clearly superior to that of Group 4 which in turn is superior to that of Groups 1 and 2.

V.—DISCUSSION.

The results of the analysis of performance on the separate question show (as might be expected) a tendency for the two groups of arts candidates to do better on the arts questions of Paper I and for the two groups of science candidates to do better on the science and numeracy questions of Paper II. Yet this tendency is far from uniform. Thus in Paper I little more than an overall significance may be claimed for the group differences on the comprehension question, and on the arts essay the only significant difference was that separating the language group from the rest. Similarly, in Paper II, it is the non-mathematics science group alone whose performance is significantly superior on the knowledge question, while on the essay question the group differences are small and statistically insignificant. More surprising perhaps is the clear separation of all four groups on the science-comprehension question, the mathematics group doing best and the language group worst. The mathematics group also does significantly better than the science group on the numeracy questions.

In combination however the questions on the two papers provide a measuring instrument that gives but little advantage to any one group. This 'balance,' too, is unaffected by the two questions not considered in this paper, namely the foreign languages question, which was found to favour the language group, and the spatial relations question, which was found to favour the science groups (and, to a less extent, the social studies group also). If one of the aims of the Board's examiners has been to construct a paper fair to candidates of different specialisms, then we must conclude that the examiners have been in this respect successful.

We have seen that no general pattern was discerned despite the existence of process categories into which both questions of arts and science content divide. The statistically significant group × process × content interaction must be accepted as evidence against the predominance of process over content inherent in all taxonomic systems such as that of Bloom (1956). It is perhaps patently unreasonable to expect the same group order to hold within process and across content when the groups have been formed in the first place from persons of differing content interests and training. The slight evidence of process predominance that does appear is in literacy. The same group order is found for both the arts and science essay—though the spread of the means on the science essay is far less. No similar trend is evident in the knowledge and comprehension categories.

There remains the question of whether general studies in the sixth form should not merely be taught but also examined. Much opinion at present is opposed to an examination. This is due partly (and understandably) to a reluctance to add to sixth-formers' examination commitments, and partly to a fear of imposing restrictions on the varied minority-time activities of different schools. (Curiously this last objection is seldom raised against the examining of specialist studies !). However, a general studies examination constructed along the lines of the J.M.B. papers, with their emphasis on aptitudinal questions and essays, could be largely free from these restrictive effects. Moreover, an unenlightened preparation for such an examination—the routine working of past papers, for instance—would bring little or no benefit. The examination need not be ' prepared for ' at all. In short, the objections to an examination of general studies seem far from convincing. Present evidence suggests the matter be considered afresh.

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THE STRUCTURE OF ABILITIES, INTERESTS AND PERSONALITY IN 1,000 SCOTTISH SCHOOL CHILDREN

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SUMMARY. About 1,000 Scottish secondary school children likely to enter one of the two Edinburgh universities were given tests of ability, aptitude, personality and interests. The main aim was to determine (at an early age and before they were required to specialise) which were potential university scientists. The most relevant measures for this purpose were identified by factor analysis, and the general structure of abilities, personality and interests of these children is described.

1.—INTRODUCTION.

THE results reported in this article were obtained as part of an extensive research sponsored by the Scottish Council for Research in Education. Some aspects of the research have already been described (Butcher and Pont, 1968; Pont and Butcher, 1968; Butcher, 1969). These earlier reports, however, have dealt only with limited and preliminary findings, and the present paper is the first to contain a statistical analysis of results obtained from the whole sample of children.

2.—GENERAL AIMS OF THE INVESTIGATION.

The primary purpose has been to carry out a longitudinal study of a large proportion of the children in one age-group likely in due course to enter the two Edinburgh universities and in particular to assess (with relation to the supposed ' swing from science ') the psychological, and to some extent also the sociological factors affecting successive degrees of subject specialisation.

3.—THE SAMPLE OF CHILDREN.

This was selected with the general aim of including as high a proportion as was practicable of the 13-year-old children in Scottish schools in 1964-65 likely to go on to either Edinburgh or Heriot-Watt University. Twenty secondary schools were included in the sample, including senior secondary, comprehensive, grant-aided and independent schools. These schools were, with one or two exceptions, as described in the earlier reports, those that had in the immediately preceding five years provided most students in the two institutions. All the pupils, numbering some 1,150, were in their second year in secondary school; this stage was chosen as being in almost all the schools the last year of a general curriculum before some degree of specialisation was involved.

4.—THE KINDS OF TEST AND OTHER MEASURES EMPLOYED.

These fell into three main classes, which may be described as ' pupil variables,' 'school variables ' and ' home variables.' The first of these refers to such measures as tests of ability, interest and personality, school marks, ratings by the pupils of school subjects and so forth.

The class of ' school variables ' includes all those assessments in which the school was the unit, e.g., the differing curricular arrangements (Pont and Butcher, 1968), the qualifications of the science staff, the laboratory facilities, the attitudes of the heads and other teachers as revealed in interviews and questionnaires.

Finally, for a subsample of about 250 children, their parents were called on at home by skilled interviewers (including a youth employment officer). An attempt was made to record the main aspirations of the parents for their children, the degree of parental encouragement and the extent of educational advantage or disadvantage resulting from home background.

The present account deals mainly with 'pupil variables,' and the nature and range of these is more fully described in the next section.

5.—VARIABLES INCLUDED IN THE ANALYSIS.

These are seventy in number ; more were available, but the analysis of the full number would have been unwieldy. For example, every pupil rated 15 careers, each on six criteria, yielding 90 ratings in all. These career ratings have been discussed in detail by Butcher and Pont (1968), and their number has been drastically reduced to eight in the present study.

The measures used may be roughly classified as follows to facilitate an overall view ; but inspection suggests that the classification is necessarily arbitrary, and that several of the measures might almost equally well be described as, e.g., either measures of ability or of interest.

Measures of ability (8).
Thurstone's Primary Mental Abilities+derived estimate of IQ (6).
IQ at transfer to secondary school.
Teacher's estimate of probability of entering university.

Measures of school attainment (4).
Standardised marks at end of first year in secondary school (English, French, Mathematics, Science).

Measures of personality (16).
Cattell's HSPQ+2 second-order factors.

Measures of general interests (10).
Kuder Preference Record.

Other measures of interest (*designed in particular to assess degree of interest in Science*) (24).
Pupil ratings of school subjects (9).
Pupil ratings of subject teachers (2).
Differential Vocabulary Test (3).
Pupil rating of careers (8).
Essay on " What I expect to be doing in five years' time."
Teacher estimate of direction of specialisation.

Biographical measures (8).
Position in family, number of brothers and sisters (3).
Father's occupation and status, number of relatives scientists (3).
Teacher's estimates of background advantage or deprivation.
Course chosen in third year.

6.—PURPOSE AND NATURE OF THE ANALYSIS.

A major aim of the longitudinal research is (*a*) to condense from the mass of available information a single estimate of the suitability of each pupil for a career in Science, taking into account both aptitude and interest at age 13, and then (*b*) to discover how far subject choice at later ages and scholastic performance correspond with the estimates of suitability, paying particular attention to those students who specialise in subjects other than Science although apparently science-oriented at an earlier stage.

The technique most appropriate for the preliminary process of condensation seemed to be that of factor analysis. A factor analysis of the scores of the entire sample on the 70 variables was therefore carried out, with two principal expectations. These were: first, that a ' suitability for science ' factor might emerge, and that the loadings on the factor would indicate the relative importance and diagnostic usefulness of the numerous possible measures; second, that apart from this specific aim, such an analysis, being on a larger scale than most reported in this country, would provide useful and interesting information both about the structure of abilities, interests and personality in school children and about the value of the tests used.

These expectations (or hopes) were surprisingly well fulfilled. The analysis produced a very adequate ' suitability for science ' factor, and also revealed an interesting and clear structure of other traits. So far as can be discovered from internal evidence of this kind, it appears that most of the tests must have been usefully valid.

7.—TECHNICAL DETAILS OF THE FACTOR ANALYSIS.

The programme used operated as follows: Inter-correlations were calculated between the 70 variables; a principal components analysis was carried out (with unity in the diagonals); those components with latent roots greater than unity were selected, according to the widely approved criterion first suggested by Guttman, and were rotated by the Varimax procedure (Kaiser, 1958). A further rotation to oblique simple structure was carried out by the Promax method (Hendrickson and White, 1964).

Another feature of the programme was the way in which it allowed for missing data. In a score matrix of size 1150×70 assembled by only one tester (H. B. Pont), there are almost inevitably some gaps. Until recently, a common practice has been to assign a mean score to the invididuals for whom scores were not available; alternatively, all people for whom a complete set of scores was not available might be omitted from the analysis. Either method resulted in loss of information or accuracy. The programme used had the advantage of calculating each correlation coefficient, where necessary, for a different number of people. If available scores on both variables A and B numbered 1,000, but on A and C and on B and C only 900, r_{AB} would be computed with $N=1{,}000$, r_{AC} and r_{BC} with $N=900$ and so on, with (in principle) each of the $\frac{70 \times 69}{2}$ coefficients being based on a different number of people. In fact, of the 70 variables 62 had 950 or more scores recorded.

Nineteen factors proved to have latent roots greater than unity and were carried through the rotation procedures. These accounted for 63·3 per cent of the total variance.

8.—DESCRIPTION AND INTERPRETATION OF THE RESULTING FACTORS.

The first ten oblique factors all proved clearly interpretable. The remaining nine appeared to be of relatively minor importance; for this reason, and because of considerations of space, the factor matrix shown in Table 1 below contains only the first ten factors.

TABLE 1

FACTOR MATRIX.

Factors :
1. Stability.
2. Scientific Orientation.
3. Mechanical Orientation.
4. General Attainment.
5. Introversion/Extraversion.
6. Verbal Reasoning.
7. Mathematical Aptitude.
8. Literary Interest.
9. Interest in Social Work.
10. Aesthetic Interest.

(Decimal points omitted)

					Factor					
Test or Rating	1	2	3	4	5	6	7	8	9	10
KUDER										
1. Outdoor	15	18	*58*	24	27	16	*50*	*35*	–10	05
2. Mechan.	08	28	*74*	19	09	19	06	*47*	24	–10
3. Computat.	20	21	14	06	01	05	*–65*	05	22	*–44*
4. Scientif.	24	*73*	*59*	*42*	10	11	07	*46*	09	*–37*
5. Persuas.	–15	–24	*–35*	–22	–25	–10	–12	–29	*37*	–08
6. Artistic.	–12	–19	–05	–12	–01	02	20	02	–04	*83*
7. Literary	–01	–23	–32	03	–00	–17	02	*–72*	03	–15
8. Musical	–01	–18	–23	02	–00	–18	04	–17	–07	–03
9. Soc. Serv.	–05	–18	*–38*	–16	–08	–04	03	01	*–70*	03
10. Clerical	–09	–16	*–45*	–30	–03	–03	*–55*	–25	34	–21
PMA										
11. V	03	10	–01	*35*	06	*–87*	09	–13	02	–07
12. S	17	04	31	29	05	–20	–26	31	–02	15
13. R	01	–12	–06	18	–05	*–56*	*–38*	–09	–21	11
14. N	–04	–16	–14	09	–01	–27	–30	–25	–17	–14
15. W	–01	–07	–09	10	–09	–31	–04	–31	–20	10
16. 2 V+R	03	06	–03	*35*	04	*–92*	–00	–13	–04	–03
HSPQ										
17. A	16	–08	–24	–12	*–71*	–02	–15	–08	–09	07
18. B	07	05	03	17	04	–31	–06	–19	06	03
19. C.	*71*	09	19	12	–22	03	–08	01	12	–11
20. D	*–72*	*–06*	–01	–03	05	04	05	–04	13	–06
21. E	–09	–06	*36*	–08	*–49*	19	04	–05	08	–13
22. F	–07	–04	20	–03	*–71*	–07	18	20	–02	04
23. G	*59*	18	03	13	12	04	–11	10	–23	–03
24. H	*68*	06	16	05	*–51*	03	01	04	01	–11
25. I	–17	–17	*–62*	–12	07	–21	09	–25	–28	31
26. J	–06	15	25	13	*41*	00	11	–05	13	–07
27. O	*–71*	–12	–12	–09	11	–02	11	–06	–11	10
28. Q_2	08	12	*37*	09	*50*	07	12	12	11	–06
29. Q_3	*57*	24	03	12	25	03	–13	18	–25	–01
30. Q_4	*–71*	–21	–12	–10	07	01	–01	–08	–01	08
31. Extrav.	33	–05	01	–05	*–09*	–03	01	–11	–07	–01
32. Anx.	*–98*	–20	–14	–12	12	–01	09	–11	06	07
DIFF. VOCAB.										
33. Sci.	19	*42*	*39*	*69*	11	–21	22	18	26	–26
34. Arts	15	23	15	*51*	08	*–54*	30	–28	11	–23
35. Sci. minus Arts	06	25	29	29	05	32	–06	*52*	19	–06

TABLE 1—FACTOR MATRIX—continued.

Test or Rating	Factor									
	1	2	3	4	5	6	7	8	9	10
36. No. Brothers	–04	01	02	–06	05	04	–03	03	–08	03
37. No. Sisters	–30	–01	04	–08	–03	01	04	01	–05	05
38. Psn. in family	00	–03	–02	–07	–06	00	02	05	–04	09
39. SEG	06	–08	14	25	–04	01	17	18	22	–15
40. F's occ. Sci.	03	07	09	12	01	–01	09	11	04	–01
41. No. relats. Sci.	07	09	09	04	09	–07	08	–00	–04	–01
RTG. OF SCHOOL SUBJECTS										
42. English	04	–12	–18	06	00	–21	06	*–43*	–25	11
43. Mathematics	15	18	15	12	04	01	*–68*	18	–05	–08
44. Latin	10	–07	–12	13	02	–05	–09	–12	–09	–12
45. Modern Languages	06	–08	–23	–02	–00	–04	–06	–16	–04	–07
46. Science	22	*83*	*40*	33	11	04	05	33	03	–11
47. History	05	–01	–12	–06	–00	–05	10	–21	–08	–03
48. Geography	14	14	16	–01	10	01	–03	13	–15	20
49. Art	–03	–02	–02	–08	–03	00	12	01	–10	*79*
50. Gym.	03	–07	33	–16	–24	15	05	16	–28	21
RTG. OF TEACHER										
51. Latin	05	–11	–12	03	03	10	–15	01	00	–07
52. Science	20	*59*	01	01	05	–17	–04	02	01	–06
TEACHER'S ESTIMATES										
53. Ability	06	10	18	*71*	08	–27	07	03	–01	–11
54. Science/Arts	10	*49*	33	14	08	11	–12	22	21	–10
55. Home Encour.	–01	13	05	21	09	–11	01	09	04	–09
SCHOOL MARKS										
56. English	04	04	–06	*57*	06	*–38*	15	*–36*	–02	–02
57. French	03	00	–18	*52*	01	–17	04	–15	10	–21
58. Mathematics	09	11	09	*61*	02	21	–34	13	09	–12
59. Science	16	*44*	17	*72*	11	–17	08	13	08	–09
60. Career Essay	08	*48*	*64*	24	13	13	01	33	10	–09
61. Transfer IQ	03	09	10	*41*	–05	*–53*	–06	–13	–05	–16
62. Science in 3rd year	14	*40*	*53*	*44*	09	07	–03	24	21	–21
RTG. OF LIKING OF CAREER										
63. Engineer	12	*35*	*70*	03	06	13	–06	21	09	02
64. Doctor	11	22	07	–02	01	01	04	–09	*–58*	–00
65. Journalist	–08	–19	–24	–17	–24	–12	–02	*–71*	–05	10
66. Research Chemist	15	*84*	*36*	29	08	03	02	21	–07	–08
67. Social Worker	–01	–14	–29	–18	–12	–10	–11	–21	*–58*	18
68 Banker	–01	–12	–06	–30	–09	07	*–49*	–21	–03	10
69. Teacher (non-Science)	–04	–23	*–40*	–05	–04	–04	–26	–18	–30	14
70. Av. of Science Careers	17	*87*	*38*	28	07	05	–04	23	–10	–06

NOTE : (i) All ratings on Science/Arts are made with Science high.
(ii) In (39) High rating implies high social class.

The ten major factors are interpretable as follows :

(1) Temperamental stability.
(2) Interest in and aptitude for science.
(3) Practical-mechanical interest (or aptitude for applied science).
(4) General scholastic attainment.
(5) Introversion-extraversion.
(6) Verbal reasoning.
(7) Mathematical-computational aptitude.
(8) Literary interest.
(9) Interest in social work.
(10) Aesthetic interest.

It is not possible within the space available to describe all these factors in great detail. A rather fuller account will be provided of the two most salient features, i.e., of the arts/science and the temperamental factors. Separate sections will be devoted to the latter, and the remaining seven factors will be briefly described in a single section. But before considering these, a few general comments may be made.

(1) The present writer has been by no means an unqualified enthusiast for the technique of factor analysis, and still less for the particular technique of rotation to oblique simple structure (Butcher 1968, Ch. 2). In the present study, however, the latter technique has unquestionably produced a very clear and meaningful structure, as detailed inspection of the factor matrix in Table 1 will confirm. In these respects it proved preferable to the unrotated set of principal components and also (though marginally) to the Varimax solution.

(2) No very satisfactory answer appears to have been found to the problem of determining the statistical significance of a rotated factor *loading*. In Table 1 an arbitrary figure of ·35 has been adopted to distinguish high and probably significant loadings. Although arbitrary, this is likely to be conservative in the case of a 70 × 1,000 score matrix.

(3) The clarity of structure and presumable significance of the salient factor loadings emphasised in the last two paragraphs are given substance by the magnitude of the loadings determining the interpretation of the factors. For the first ten factors, these are all of size ·7 to ·9.

(4) It is remarkable that personality factors have appeared so prominently and so fully in line with theoretical formulations. The HSPQ was included in the battery of tests because of theoretical interest in the structure of children's personality as well as from an expectation that scores might be related to arts/science orientation. As suspected, no very strong relation was found between personality factors and subject orientation, but personality differences emerged more clearly than expected. These points will be amplified in section 10.

(5) Several of the minor factors indicate a more definite structuring of the interests of 13-year-old children than might have been expected. As one example, factor 9 is identified by three loadings over ·5. The highest is that of ·7 on the ' social service ' sub-scale of the Kuder Preference Record. The other two are ratings of the careers of doctor and of social worker. This is rather striking evidence to the effect that (*a*) children of this age have a clearly differentiated interest in ' social work,' and that (*b*) an American questionnaire designed for adults or late adolescents may have considerable validity in assessing such interest.

(6) In discussing the oblique rotated factors, it will be convenient to deal with the major ones first, and gradually descend to those accounting for less variation. It is only with orthogonal factors, however, that a precise statement of variance accounted for can be made. Nevertheless, the oblique factors in the present analysis (rotated by the Promax procedure) differ rather little from the Varimax factors obtained at an earlier stage. An approximate ordering is therefore possible.

9.—THE SCIENCE/ARTS ORIENTATION FACTOR.

Since the battery was assembled with the prime intention of including measures relevant to future subject specialisation, it was hoped that a major factor of this type would emerge.

As shown in Table 2 below, 11 variables had positive loadings of ·35 or higher on the factor.

TABLE 2

THE SCIENCE/ARTS ORIENTATION FACTOR (FACTOR 2).

Description of Measure	Factor loading
Composite rating of the careers of research chemist, physicist and science teacher	·87
Rating of the career of research chemist	·84
Rating of science as school subject	·83
Kuder Preference Record (scientific interest)	·73
Rating of science teacher	·59
Teacher's estimate of scientific orientation	·49
Essay (' What I shall be doing in five years ')	·48
School marks in science	·44
Differential vocabulary test (Knowledge of scientific terms)	·42
Course taken in third year	·40
Rating of career of engineer	·35

It is noticeable that this list contains no extraneous material, and that each of the variables blindly selected by the procedure is extremely relevant. This also applies to the other appreciable positive loadings below the arbitrarily selected level of +·35. These are (all between ·2 and ·3), listed in descending order—mechanical interest (Kuder), differential vocabulary score (science minus arts vocabulary), rating of career of doctor, computational interest (Kuder).

Rather few measures have appreciable negative loadings on this factor, only three being larger than —·2. In the present case, they appear only moderately meaningful in defining the non-scientific pole. They are ' persuasive interest ' (Kuder), HSPQ factor Q_4 (nervous tension), and rating of teacher (of subjects other than science) as a career.

An interesting feature of Table 2 is that the pupils' ratings of school subjects and of careers appear better indicators than the ' real-life ' criteria such as school marks and course chosen in third year. The comparatively low loading of the last variable suggests that when the proposed follow-up is carried out (as described in section 6, paragraph 1), a considerable number of individual pupils may be found whose career deviates from that indicated by their apparent interests and aptitudes.

10.—THE PERSONALITY FACTORS.

As already mentioned (section 8, comment 4), it seems surprising that two major factors (1 and 5) should be provided by the single HSPQ test, although this yields 14 separate scores. This is the more striking in that only form A of the test was administered, so that each separate personality score was based on only three minutes' testing time. One relevant consideration is that the sample of children was restricted in terms of ability (mean IQ at transfer was 122), but presumably unrestricted in range of temperament. Nevertheless, both the proportion of variance contributed by the HSPQ in this survey, and the plausible and meaningful structure revealed, strongly support Cattell's arguments for the possibility of validly assessing children's personality by questionnaire techniques and his strategy of employing a large number of relatively independent dimensions, even though this entails spreading them thinly in terms of testing time.

Loadings of the 14 HSPQ sub-scores and of the two second-order factors derived from them are shown in Table 3.

TABLE 3

THE TWO MAJOR (SECOND-ORDER) PERSONALITY FACTORS.

Description of factors	Popular Title		Factor Loadings	
	Low Score	High Score	Factor 1 (Stability-anxiety)	Factor 5 (Introversion-extraversion)
HSPQ Factor A	Aloof, Stiff	Warm, Sociable	·16	—·71
B	Dull Intellectually	Bright Intellectually	·07	·04
C	Emotional, Immature Unstable	Mature, Calm	·71	—·22
D	Stodgy	Unrestrained	—·72	·05
E	'Milk-toast,' mild	Aggressive, Competitive	—·09	—·49
F	Sober, Serious	Enthusiastic, Happy-go-lucky	—·07	—·71
G	Casual, Undependable	Conscientious, Persistent	·59	·12
H	Shy, Timid, Threat-Sensitive	Adventurous, 'Thick-skinned'	·68	—·51
I	Tough, Realistic	Aesthetically Sensitive	—·17	·07
J	Liking Group Action	Fastidious Individualism	—·06	·41
O	Confident, Self-Secure	Timid, Insecure	—·71	·11
Q_2	Sociably Group Dependent	Self-Sufficient, Resourceful	·08	·50
Q_3	Uncontrolled, Lax	Controlled, Exacting Will Power	·57	·25
Q_4	Relaxed, Composed	Tense, Excitable, Frustrated	—·71	·07

The 'stable' pole of the first main temperamental factor is defind by the following loadings: C+ (mature, calm) ·71, H+ (adventurous, 'thick-skinned') ·68, G+ (conscientious, persistent) ·59, Q_3+ (controlled, exerting will-power) ·57. The 'anxious' pole is defined as follows: D+ (unrestrained, excitable) —·72, Q_4+ (tense, excitable, frustrated) —·71, O+ (timid, insecure, guilt-prone) —·71.

The 'introvert' pole of the second temperamental factor is defined by: Q_2+ (self-sufficient, resourceful) ·50. J+ (fastidious individualism) ·41. The 'extravert' pole is defined by: A+ (warm, sociable) —·71, H+ (adventurous, 'thick-skinned') —·51, E+ (aggressive, competitive) —·49.

All these loadings agree quite closely with Cattell's formulation of the two main second-order factors, and the salience of these two is also in agreement with Eysenck's theory of personality structure. The loadings listed in the preceding two paragraphs are the only high ones among all 70 variables (see Table 1). Weighted estimates of introversion and anxiety, derived from the formulas in the HSPQ, were included as separate variables (Nos. 31 and 32 in Table 1).

It is striking evidence of the cross-cultural stability of such weightings that their loadings on the two factors were respectively ·896 and ·982. Although, as already mentioned, the investigation of personality structure was not a primary aim in the research, it is doubtful whether this structure has ever emerged more clearly and unequivocally.

11.—DESCRIPTION OF OTHER FACTORS.

Factors 1, 2 and 5 have already been discussed in some detail, and factor 9 briefly.

Factor 3 is of considerable interest in view of the main purpose of the research. It is interpretable as another ' scientific ' factor, but with emphasis on applied science. The highest positive loadings are : Kuder sub-scale of mechanical interest, rating of the career of engineer, essay on future career (scored for science), Kuder scientific interest, Kuder outdoor interest, science course taken in third year, rating of science as school subject, science score on differential vocabulary test. The highest negative loadings are on factor 1 of the HSPQ (tender-mindedness, ' protected emotional sensitivity '), Kuder clerical interest, rating of the career of teacher (of subjects other than science), Kuder social service interest, Kuder persuasive interest.

It is perhaps rather surprising that two separate factors should emerge so clearly at age 13, corresponding to interest in pure and applied science. The appearance of HSPQ factor I is also of interest in two respects. First, it was suggested by Cattell in correspondence before the research was started that this was the personality factor most likely to be related to arts/science orientation. Second, this relation (indicated by a loading of ·62) has emerged only in connection with the *applied* science factor. On factor 2 (the pure science factor discussed in section 9) the loading was low (·17) and in the non-science direction. It thus appears that the picture of the ' tough-minded ' engineer or applied scientist is no mere stereotype, but represents a pattern of interest and temperament formed early in life.

The factors under discussion are correlated, not orthogonal, and one might expect a marked degree of correlation between the two ' science ' factors. This in fact amounts to +·36, considerably higher than the average of such correlations (see Table 4).

TABLE 4

INTER-CORRELATIONS OF THE TEN PRINCIPAL OBLIQUE FACTORS.

	2	3	4	5	6	7	8	9	10
1. Temperamental stability ..	225	158	172	–069	–013	–072	123	–053	–087
2. Science aptitude		356	302	168	013	031	237	073	–180
3. Aptitude for applied science			289	036	141	161	354	049	–065
4. Scholastic attainment				134	–284	108	154	086	–217
5. Introversion					–012	031	134	–018	007
6. Verbal reasoning						043	343	069	–017
7. Computational aptitude ...							000	011	032
8. Literary interest								026	002
9. Interest in social work									–326
10. Aesthetic interest									

Factors 4 and 6 are clearly interpretable as 'general scholastic attainment' and 'verbal reasoning.' The attainment factor has 12 high loadings. Ten of these are clearly indicators of general attainment, as follows: standardised marks on school subjects (variables 56–59), teacher rating of probability of entering university, 'science' and 'arts' scores on Differential Vocabulary Test, IQ at transfer, PMA score (2V+R), and PMA verbal score. The remaining two are Kuder scientific interest and third-year course (scored for science). These latter are ninth and tenth in rank order of loadings (·415 and ·410), but provide some suggestion that the more generally able students are inclined towards science and choose scientific courses. There are no very high loadings at the opposite pole of this factor; the highest (·30) is rating of the career of banker.

Factor 6 (interpreted as 'verbal reasoning') is very clearly defined. The five highest loadings include 3 scores from the Thurstone PMA—2V+R (·92), V (·87) and R (·56), and also 'arts' score on the Differential Vocabulary Test and IQ at transfer. The only other high loading is of teacher's estimate of likelihood of entering university.

Factor 7, interpreted as mathematical-computational aptitude, has six high loadings as follows: rating of mathematics as a school subject, Kuder computational interest, Kuder clerical interest, rating of career of banker, PMA reasoning, school marks in mathematics. The next highest loading (·30) is PMA numerical. The only high loading at the other pole is of Kuder outdoor interest.

Factor 8 is a factor of literary interest. The two highest loadings (both over ·7) are of the Kuder literary interest sub-scale and of rating the career of journalist. The other two high loadings at this pole are rating of English as school subject and marks in English. High loadings at the opposite pole are Differential Vocabulary Test (science minus arts) and Kuder mechanical and scientific interests.

Factor 10 is clearly one of artistic or aesthetic interests, the two highest loadings (both about ·8) being of the Kuder artistic interest sub-scale and of rating art as a school subject. The only other sizeable loading in that direction, interestingly enough, is HSPQ factor I ('protected emotional sensitivity') just over ·3. The Kuder sub-scales of computational and scientific interests have largeish loadings in the opposite direction.

12.—HIGHER-ORDER FACTORS.

The 19 oblique factors, of which the first 10 have been discussed in preceding sections, were subjected to a second-order analysis, again by the Promax procedure. Six second-order factors resulted, which can be described only briefly. It is hoped to report the analysis more fully in a later paper or research note.

The largest of these second-order factors is again very clearly interpretable in terms of 'aptitude for science' and appears to have incorporated factors 2 and 3 at the first order and also to indicate more clearly some of the variables at the opposite pole. Salient loadings are as shown in Table 5.

The second factor is plainly one of temperamental anxiety, similar to factor 1 at the first-order level; the four highest loadings at the positive pole are: anxiety (weighted score from HSPQ), and three other HSPQ scores (D, Q_4 and O). There are nine high loadings at the other extreme. Four of these are again HSPQ scores in line with expectation (H, C, G and Q_3). It is interesting to note the other measures with high loadings on this factor; they are, at the ' anxious ' pole, Kuder persuasive interest, and at the ' stable ' pole, five indicators of orientation towards science, as follows : rating of mathematics as school subject ; composite rating of careers of research chemist, physicist and science teacher ; rating of career of research chemist ; Kuder scientific interest ; and rating of science as school subject.

TABLE 5

THE SECOND ORDER FACTOR OF ' SCIENCE-ORIENTATION.'

Description of Variable	Factor Loading
Scientific interest (Kuder Pref. Record)	·68
Mechanical interest (Kuder Pref. Record)	·61
Rating of science as school subject	·59
Essay on future career (scored for science)	·57
Composite rating of careers of research chemist, physicist and science teacher	·54
Differential vocabulary test (science minus arts)	·54
Teacher's estimate of science/arts orientation	·53
Third-year course followed (scored for science)	·53
Rating of the career of research chemist	·50
Rating of the career of engineer	·48
Clerical interest (Kuder Pref. Record)	—·35
Rating of English as school subject	—·36
Rating of the career of teacher (of subjects other than science)	—·39
Rating of the career of journalist	—·40
Rating of Latin as school subject	—·44
Musical interest (Kuder Pref. Record)	—·49

3.—DISCUSSION OF RESULTS.

This will be brief, since some of the main points have already emerged earlier in the report.

First, the results of the factor analysis shown in Table 1 represent almost a textbook example of the power of the technique to reveal the basic structure in a bewildering mass of data. Detailed inspection of the table will indicate a number of interesting subsidiary relations between the variables besides those reviewed.

Second, the Kuder Preference Record and the High School Personality Questionnaire accounted between them for a remarkably high proportion of variance. Some doubt was felt when planning the research about including these tests ; both are American, and the Kuder was disigned for older age-groups. Measures of divergent thinking were a tempting alternative, but the actual choice seems to have been justified.

Third, the direct relevance of the various types of measure to the main aim of the research can probably best be assessed from inspection of Table 5, which shows loadings on the second-order factor of ' science-orientation.' Salient variables include, for instance, Kuder sub-tests, ratings of different school subjects and of careers, a rating by teachers of science orientation and an essay on future career. Actual marks in school subjects do not appear, nor do sub-scores of Primary Mental Abilities. The differential power of the latter seems negligible in the present context—less than that of the ' home-made ' Differential Vocabulary Test.

The analysis reported here, although extensive, did not include either the 'school variables' or the 'home variables' referred to in Section 3, so that the picture conveyed is provisional and incomplete. It seems likely that the influence of parents and school may considerably affect actual subject choice, and it will be interesting to see how such influences interact with traits as assessed by psychological tests. These 'home' and 'school' data are still being analysed and will be reported in later papers.

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A LONGITUDINAL STUDY OF THE RELATIONSHIP BETWEEN ANXIETY AND STREAMING IN A PROGRESSIVE AND A TRADITIONAL JUNIOR SCHOOL

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SUMMARY. Sarason's General and Test Anxiety Scales were administered to children of two English junior schools on three equally spaced occasions over a twelve-month period. The 11+ examination was taken between the second and third testing occasions. The children of one school experienced streaming by ability throughout; those of the other school remained unstreamed until after the first testing. Although in some cases GA and TA scores yielded parallel findings, the two scales show some differential sensitivity. Differences in school regime and interactions with this factor were found to affect General Anxiety scores; whereas Test Anxiety scores showed different relationships with ability (streams) on different testing occasions. The approach of the 11+ examination maintained the level of anxiety against the usual downward trend found for repeated measurements of anxiety in the school which had not previously experienced a strongly competitive classroom atmosphere. The complexity yet meaningfulness of the interactions found suggests that there are dangers in assembling overall results concerning anxiety scales from different schools and different sexes, as has been done in several previous studies.

I.—INTRODUCTION.

THE development of anxiety questionnaires for use with school children (Lynn, 1955; Castenada, McCandless and Palermo, 1956; Sarason, Davidson, Lighthall and Waite, 1958; Cox and Leaper, 1959) has given rise to a great deal of research which may have implications for our educational system. But many of these studies have been concerned with demonstrating the more global properties of the tests, for example, their reliability and their correlation with intellectual variables, and with personality measures. Others have reported the effect of different experimental conditions on the relationship between anxiety and achievement. Few studies have combined the two approaches by examining the possible effects of naturally occurring 'treatments' on these relationships. If anxiety is regarded as a drive variable which is relevant to scholastic performance, then different functional relationships between anxiety and achievement may result from different classroom or school regimes. The present study employs Sarason's General Anxiety Scale for Children (GA) and his Test Anxiety Scale for Children (TA) in an attempt to demonstrate such a possibility.

In a series of studies in North American children, Sarason and his co-workers (Sarason, Davidson, Lighthall, Waite and Ruebush, 1960; Sarason, Hill and Zimbardo, 1964; Hill and Sarason, 1966) established a number of basic findings which are directly relevant to our data. Among the findings which relate to repeated or longitudinal use of the tests are the following: that both GA and TA scores are lowered on average with repeated testing of the same children; that changes in individual TA scores are strongly related to changes in defensiveness, larger reductions in TA being associated with increases in score on the Defensiveness Scale for Children and the Lie Scale for Children; that girls score higher than boys at all age levels; that TA scores typically show a small but reliable negative relationship with intelligence and achievement measures; and that GA scores show a zero or slightly positive relationship to these measures.

Sarnoff *et al.* (1958) reported that English children have higher TA scores than American children, but similar GA scores. In a further study of English children, Sarnoff *et al.* (1959) found that TA scores fell as the 11+ examination approached, which was contrary to their expectation. The same workers also failed to find the expected negative correlation between TA scores obtained on the second testing and 11+ results. They concluded as follows: that " regardless of country, sex or age, the mean TA scores of all groups—English and American—tend to decline from test to re-test " ; that English children are especially more vigilant and defensive as the 11+ examination approaches; and, that the 11+ examination holds 'such extreme dread' that the usual relationship between anxiety and performance is nullified. Cox (1962) reported that in two Australian schools the children in the lower ability streams had higher TA scores than children in the higher ability stream. Although this finding is in line with those American studies which report a negative relationship between TA scores and academic performance, Cox concluded that streaming practices are among those factors which promote test anxiety. The question remains, therefore, whether Cox's results are due to the effects of streaming as such or whether they are due to the ability differences which give a basis for the streaming. Taking the Sarnoff-Cox results as their starting point, Pringle and Cox (1963) predicted that English children in an unstreamed school would have lower TA scores than children in a streamed school, but found the reverse to be true. The children in the unstreamed school also showed much higher GA. A higher vigilance and defensiveness among the children of the streamed school who were more familiar with tests and testing was offered as a possible explanation.

II.—THE PRESENT STUDY.

The present data form part of a larger longitudinal study of two English junior school populations in the Midlands and are used to examine the effects of repeated administration of the Sarason scales in relation to differences in school regime, streaming, sex and 11+ examination. The schools themselves are good academically but differ greatly in their approaches (Pringle and Cox, 1963; Gooch and Pringle, 1966, pp. 2-4). Some consequences of the different approaches for the educational progress of the children were discussed by Gooch, Levy and Pringle (1967). In what may be termed the 'traditional' school (School T) the headmaster believes in a mainly adult-directed, traditional form of education, in which academic competition, streaming by achievement, class teaching and progress testing are among the educational factors emphasised. In the 'progressive' school (School P) a mainly child-centred system is claimed. Children are allocated to classes within an age group according to date of birth, and stay together throughout the first three years of junior school. Academic achievement and progress testing are said not to be emphasised in the classroom. This school is, however, streamed according to ability at the beginning of the fourth year when the children face the 11+ examination and prepare for transfer to secondary schools. The existence of this feature makes the data particularly appropriate for testing Cox's conclusion that streaming promotes test anxiety.

The samples consist of those 181 boys and girls in the two schools who completed the Sarason test on three occasions: towards the end of their third year in March; at the beginning of their fourth year in October, by which time the children of School P had been streamed; and in April of the following year, two months after the 11+ examination. Thus the testings took place on three equally spaced occasions. The TA and the GA Scales were administered by the psychologist in charge of the larger longitudinal study (M.L.K.P.), who was well-known to the children. Over the years they had repeatedly been given the assurance that neither their teachers nor their parents would be allowed to see any of their replies, that none of the work they were doing for the investigator had any bearing on or relation to the '11+' selection examination, and that it was part of a research project. This background of research testing, it is hoped, helped to avoid some of the problems associated with the administration of personality scales by teachers or others intimately linked with the school system noted by Sarason *et al.* (1960). Otherwise, the author's instructions for administering the scales were followed. They were taken by groups of children varying in size from 20 to 35, except for the slowest pupils in whose case the number was reduced to no more than half-a-dozen.

In the results which follow it is important to note that the variable 'Stream,' means that stream—A, B, or C—into which the children were placed at the beginning of their fourth year. In School T no special meaning attaches since most of the children remained in the same stream between the third and fourth years. In School P, however, the allocation of children to a stream at the time of the first testing is entirely notional since the children were not in fact in streams at that time, and neither the children nor the teachers had advance knowledge of how individual pupils were to be streamed some months later.

III.—ANALYSIS AND RESULTS.

Results are presented separately for each anxiety measure. Comparison of the findings is deferred to a later section. Both sets of data were treated as multifactored within the framework of an analysis of variance. The analysis follows the general procedure outlined by Winer (1962) for multifactor plans having repeated measurements on the subjects using an unweighted means analysis, where the harmonic mean of the numbers in the sub-groups is 12·8. Certain trends across testing occasions and across streams were also examined. Copies of the complete summary tables for both analyses of variances are available from the authors.

Table 1 shows the mean General Anxiety (GA) scores for each combination of school, sex and stream on each of the three testing occasions. Table 2 shows the data which relate to the significant ($p < \cdot 05$) sources of variance. If we were to attend only to the overall results, as has been done in many previous studies, then the sex difference, girls scoring higher than boys, is quite marked (Table 2a); mean scores fall with repeated testing in a regular manner (2c); and School P shows higher GA than School T (2d). The first two results agree with the findings previously quoted. The third confirms the result found in the study by Pringle and Cox (1963) referred to earlier, which used only a part of the present data. There are, however, three two-way interactions which complicate these simple findings. The school by sex interaction (Table 2a) shows that while the girls score higher than the boys in both schools the difference is greater in School P. The school by stream interaction is more serious in its implications, because here the pattern of the mean scores across the streams is not the same in both schools (2b). In School P there is a clear trend for higher GA to be found in the lower streams, whilst in School T the B stream has the highest mean. These results are broadly true for each sex and for each testing occasion, and the absence of higher order interactions confirms this impression. The third significant interaction is that between the factors school and testing occasion (2c). The overall result, noted above, for mean GA to fall with repeated testings hides a marked difference between the schools in this respect: School T shows the oft-reported fall-off in scores, whereas School P shows a failure to fall or even a tendency to rise.

TABLE 1

Mean GA Scores by School, Sex, Stream and Testing Occasion.

		School T			School P		
	Stream	A	B	C	A	B	C
	Occasion:						
Boys	1st	9·0	10·3	8·9	9·6	9·7	11·6
	2nd	8·2	9·4	7·7	9·8	9·5	10·6
	3rd	6·1	5·8	7·3	10·8	10·1	11·7
	(N)	(15)	(20)	(11)	(15)	(13)	(10)
Girls	1st	17·0	18·8	15·8	17·8	21·3	23·0
	2nd	14·7	16·6	13·6	16·2	23·0	23·2
	3rd	13·7	14·4	9·3	17·3	22·8	23·0
	(N)	(23)	(17)	(10)	(29)	(12)	(6)

TABLE 2

Significant Comparisons of GA Means Found by Analysis of Variance.

Factors		School T	School P	Totals	Notable Differences
(*a*)	Boys	8·1	10·4	9·2	Sex***
Sex	Girls.....	14·9	20·9	17·9	School × Sex*
(*b*)	A	11·5	13·6	12·5	
Stream	B	12·5	16·1	14·3	School × Stream*
	C	10·4	17·2	13·8	
(*c*)	1st	13·3	15·5	14·4	
Testing	2nd ...	11·7	15·4	13·5	Occasion***
Occasion	3rd	9·4	16·0	12·7	School × Occasion***
(*d*)	School ..	11·5	15·6	13·5	School***

*p< ·05. **p< ·01 ***p< ·001

Turning to the results for Test Anxiety (TA), Table 3 shows the mean scores of all sub-groups in a similar manner to Table 1, and Table 4 summarises the data which relate to the significant ($p < \cdot05$) sources of variance. As for GA the higher scores of the girls (Table 4a) and the drop in mean score over repeated testings (4d) are notable, but this time the school difference is not marked. Instead, there is a strong overall trend for low TA in the higher ability streams (4b). Once again, the results from simple comparisons agree with many previous reports, but the complete analysis detects serious interactions which may spoil simple generalisations of this type. The sexes differ in the degree to which their TA scores fall over the three testing occasions, the girls' scores falling at a lower rate than the boys' scores (4a). The stream by occasion interaction (4b) is also a simple one if we look at the data broadly. The tendency is for the lower streams to show more TA, but this tendency differs in strength from one testing occasion to the next. More seriously, however, the pattern of means for schools over occasions (4c) shows that the systematic drop in mean TA is only true for School T, School P showing, if anything, a rise on the second testing occasion before a fall in scores by the third testing. The three-factor interactions which are noted in Table 4 were found only after highly detailed trend analysis. In view of the number of effects studied in relation to the sample sizes, it would be dangerous to place too much reliance on the existence of these subtle higher order interactions.

TABLE 3

MEAN TA SCORES BY SCHOOL, SEX, STREAM AND TESTING OCCASION (NS AS IN TABLE 1).

		School T			School P		
	Stream	A	B	C	A	B	C
	Occasion :						
Boys	1st	10·1	10·5	12·8	7·3	11·0	11·9
	2nd	8·6	8·1	11·0	7·1	11·5	9·7
	3rd	5·7	4·1	10·1	8·3	6·8	8·5
Girls	1st	14·1	14·3	11·9	12·6	13·0	14·3
	2nd	12·0	11·8	7·8	10·3	16·8	16·7
	3rd	11·0	9·2	13·0	10·0	13·8	16·7

TABLE 4

SIGNIFICANT COMPARISONS OF TA MEANS FOUND BY ANALYSIS OF VARIANCE.

Factors		Testing Occasion			Totals	Notable Differences
		1st	2nd	3rd		
(*a*) Sex	Boys ..	10·6	9·3	7·3	9·1	Sex***
	Girls... ..	13·4	12·6	12·3	12·7	Sex × Occasion*
(*b*) Stream	A	11·0	9·5	8·8	9·8	Stream ** Stream × Occasion**
	B	12·2	12·0	8·5	10·9	†School × Sex × Stream* †School × Stream × Occasion*
	C	12·7	11·3	12·1	12·0	†Sex × Stream × Occasion*
(*c*) School	T	12·3	9·9	8·9	10·3	School × Occasion*
	P	11·7	12·0	10·7	11·5	
(*d*)	Occasion ..	12·0	10·9	9·8	10·9	Occasion***

*$p<{\cdot}05$ **$p<{\cdot}01$ ***$p<{\cdot}001$ †not shown.

IV.—DISCUSSION AND CONCLUSIONS.

On the basis of arguments advanced by Sarason *et al.* (1960), the prediction would be that GA scores are less affected by specific situational variables both in and out of school than are TA scores. Cox (1962), for example, reported that while the two anxiety scores are highly correlated, TA scores showed up an interaction between type of home and type of teacher, whereas GA did not. Sarason (1963), using items modified for use with older subjects, presented both arguments and evidence that TA is more highly related to performance in a testing situation than is GA. In the present data, three findings apply to both GA and TA scores. The first of these refers to the well-founded sex difference, girls scoring higher than boys. The second refers to the fall in scores with repeated use of the tests. The third finding which applies to both scores is that there is a different pattern of mean scores across testing occasions within each school which modifies the generalisation about the fall in scores just mentioned. This interaction detects the failure of both scores to fall on the second testing occasion in School P; but on the third occasion GA remains high in this school whereas TA shows a fall. It might be suggested tentatively that the onset of streaming and the coming of the 11+ examination arouses previously unexperienced anxieties in the children of School P, both generally and specifically. The passing of the 11+ examination by the third testing might then be supposed to allow TA to fall, even in School P, while GA remains high in that school as a function of the continuing and more widespread social effects of streaming.

The results specific to GA concern the school factor. The schools differ overall, and in the extent to which the girls score higher than the boys within the schools. The schools also differ in having a different pattern of mean scores across the streams. In School P mean GA is low for the A stream and higher for the B and C streams, whereas the B stream has the higher mean in School T. These relations, it will be recalled, hold true for each sex and for each testing occasion as confirmed by the absence of higher order interactions. The results specific to TA concern streaming, the trends over testing occasions, and interactions with these factors. The overall tendency for the C stream to have higher TA varies in its strength across occasions and to a lesser extent across sexes and schools. Thus, while the results specific to GA concern the school difference and interactions with this difference, the four results specific to TA concern the stream and testing occasions factors and their interactions. It might be argued, therefore, that GA is more influenced by the broad difference in school regime, but that TA is affected by more specific situational factors such as streaming within the schools and events surrounding the testing occasion. While the approach of the 11+ examination may be one of the factors which maintains the level of anxiety in School P, its effect in School T is more subtle, the A stream temporarily becoming more test anxious than the B or C streams.

In general, the results for School T are more similar to those widely reported with respect to sex differences, and the drop in scores with repeated testing. The children of this school are familiar with streaming by ability, with testing and with a competitive atmosphere throughout their junior school years. By contrast, the children of School P are less familiar with social groupings formed on the basis of ability. The dual stress of streaming and the approach of the 11+ examination may reasonably be thought to account for the maintenance of anxiety level against the usual trend. In School T, which on balance we would suspect is more typical of English schools, it might be hypothesised that maximal anxiety concerning tests is aroused perhaps even years ahead of the 11+ examination. The failure of Sarnoff *et al.* (1959) to detect the effect of the 11+ examination may be due, therefore, to the choice of two English primary schools which correspond more closely to School T than to School P. With regard to Cox's remarks about the effect of streaming on anxiety, it should be noted that in the present data TA is high in the low ability group and low in the high ability group even in School P on the first testing occasion at a time when the children had not yet been streamed. Thus, there is no necessary conclusion that streaming raises the anxiety scores of C stream children relative to those of the A stream children ; the usual negative relationship between TA and ability may well be a sufficient reason for Cox's ' effect of streaming.'

The study by Cox (1962) also used just two schools, but he reported that they yielded " extremely similar results on both anxiety scales, for all categories of children," including presumably those of different ability groups and ages. Lynn (1957), studying the relationship between achievement discrepancies and anxiety, also used only two schools, but one represented the primary level and the other the secondary school age group. The possibility that findings would differ from school to school was not therefore investigated. McCandless, Castenada and Palermo (1956) who studied the relationship between anxiety and social status, did however note a marked heterogeneity of the correlation coefficients across 15 classes of children from four schools. They speculate that this may be due to different ' class climates ' influenced in part by different teachers. Cox (1960) obtained data from five schools, but the 96 boys were treated as one sample.

The complexities of our data show well enough the danger of assembling overall results from different schools, from both sexes and from several testing occasions. It is not sufficient, for example, to show that schools do or do not differ markedly in their mean scores, because the school factor participates in several interactions in the present data. On the other hand, it is encouraging to find evidence that the tests are sensitive enough to detect situational variables at least in the school where the prior regime does not appear to have mobilised maximal anxiety. In concept, anxiety is both a ' status ' variable, showing more-or-less stable individual differences, and a ' process ' variable, showing modifications in level according to the situation. This distinction also corresponds somewhat to the experimental-observational dichotomy. Thus, there are those observational studies which agree very closely in their findings because of the homogeneity of the treatment of the children in their natural settings ; there are other studies which attempt to manipulate the relationship of anxiety to other variables by the imposition of different experimental treatments. Our data suggest that Sarason's tests are capable of serving in both roles if we are clear about the framework of circumstances within which our measurements are taken.

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SOME ASPECTS OF PERCEPTUO-MOTOR DISABILITY IN 5½-YEAR-OLD CHILDREN

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Summary. 150 5½-year-old children were given the Bender Gestalt Test. Using the Keogh and Smith scoring method, two groups were formed from the highest (H group) and lowest (L group) scoring children. Both groups were then given several perceptual and perceptuo-motor tasks, designed to measure some of the component skills involved in pencil-pattern copying. A standard scoring method was used in all except a matching task, in order to investigate and compare the pattern of inter-dependence among the hypothesised component skills. It was found that this pattern differed in the H and L groups, and also within the L group. Both groups were followed up after 17 months, when the attainment of the H group in hand-writing and spelling was found to be higher than that of the L group.

I.—INTRODUCTION.

PERCEPTUO-MOTOR impairment in children has, until recently, been used mainly as a predictor of educational failure or as a diagnostic indicator of organic deficit. Little attention has been paid to the nature of the impairment itself. However, more recent work (Bortner and Birch, 1962; Ayers, 1965) has emphasised that performance on perceptuo-motor tasks depends on a variety of component skills, and that failure on a given task may involve only some of them. Attempts to identify these component skills have been made in a variety of factor-analytic studies (e g., Thurstone, 1944) and more recently in task-analysis type studies (Birch and Lefford, 1967; Maslow *et al.*, 1963; Wedell, 1964).

In a previous study (Wedell, 1964) the development of three types of postulated skills involved in pattern copying was investigated in pre-school children. Groups of children aged 3 : 9, 4 : 6 and 5 : 3 were asked to match four standard patterns, to trace them, to copy them with strips of plasticine, and to copy them free hand with pencil. The matching task was intended to measure visual discrimination, and the tracing task, eye-hand co-ordination. The plasticine task was intended to indicate the spatial organisation of voluntary movement involved in pencil copying. A standard scoring technique was devised for all except the multiple choice matching task, in order to investigate the interdependence of these skills. It was found that some of the component skills became clearly differentiated by the age of 5 : 3. The present study was designed to compare the interdependence of these skills in children with good and poor performance at this age. An opportunity to obtain groups of 5½-year-old children occurred in the course of a normative study of the Bender Gestalt Test (Keogh, 1966).

II.—METHOD.

Selection of High (H) and Low (L) Scoring Groups.

150 children aged 5 : 6 (±3 months) were chosen from four infant schools, selected as representative of the normal range of socio-economic backgrounds.

The children were given the Bender Gestalt Test in groups of 10 at a time, according to the group administration procedure developed by Keogh and Smith (1961). The children were tested in their own schools. Children with known uncorrected visual or motor defects were excluded.

The children's pattern copies were scored on a five-point scale (total score 45) devised by Keogh and Smith (1961) for this age group. The H and L groups were then formed out of the 20 highest and 20 lowest scoring children, respectively. The H group contained 12 boys and 8 girls, and the L group 7 boys and 13 girls. The difference in distribution of sexes was not significant. The mean ages of the H and L groups were 5 years 7 months and 5 years 6 months, respectively.

Investigation of H and L Groups.

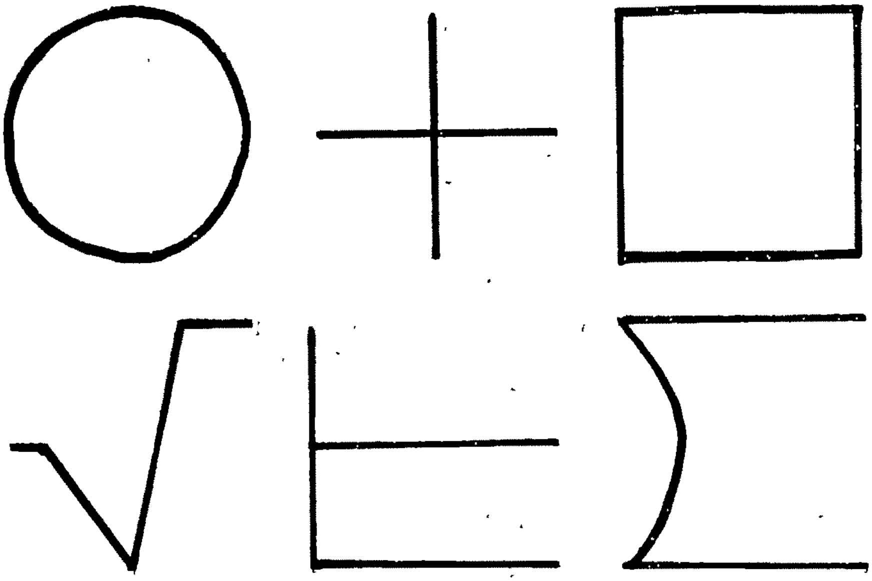
The children in the H and L groups were revisited for further individual testing in their own schools shortly after the administration of the group tests. The following tasks were given in the order in which they are described.

Perceptual and Perceptuo-motor tasks.

The six patterns shown in Figure 1 were used in these tasks. The circle, cross and square were chosen from the Binet Scales. The last three patterns were used in a previous study (Wedell, 1965), pattern 4 representing an asymmetrical open shape, patterns 5 and 6 representing asymmetrical, open letter-like shapes incorporating curved and straight lines.

FIGURE 1

PATTERNS USED IN PERCEPTUAL TASKS.

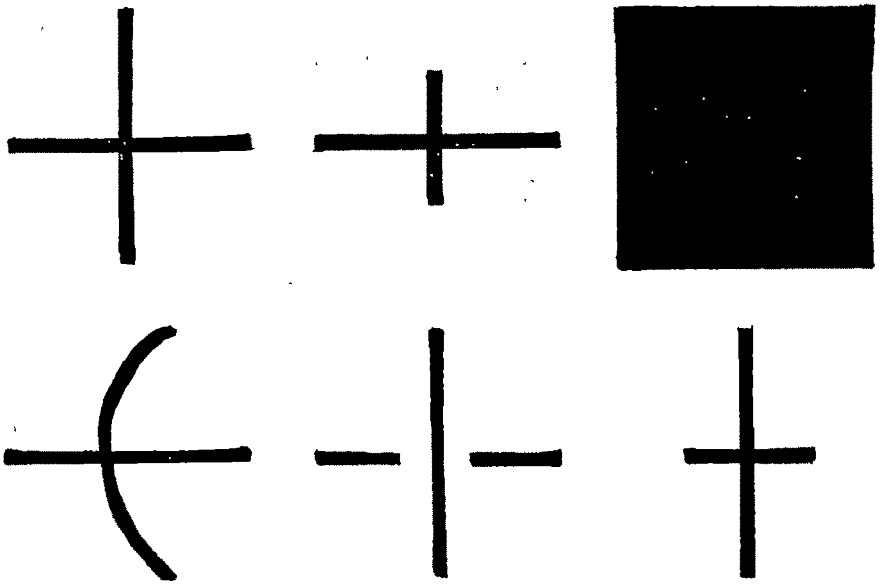


(*a*) *Matching Task.*

The children were presented with stimulus cards showing individual patterns (2-in. high). They were required to identify each pattern on multiple choice cards showing both the correct pattern, and four transformations of the pattern. The principles of transformation were derived from some of those used by Gibson, *et al.* (1962). A sample multiple choice card is shown in Figure 2, the patterns being transformed by lengthening, narrowing, interrupting and changing a straight line to a curve.

FIGURE 2

Sample Multiple Choice Card.



The children were initially given a trial stimulus and multiple choice card. The score was the number of correct choices (maximum score 6).

(*b*) *Tracing Task.*

The six patterns were presented on separate sheets, each pattern being reproduced 5-in. high in double lines (' tramlines ') ¼-in. apart. The children were required to trace a line between the ' tramlines.' The length of ' tramline' within which each child correctly traced his line was measured with a map mileometer. His score was then expressed as a percentage of the maximum length of ' tramline ' for each pattern, the maximum score for the six patterns thus being 600.

(*c*) *Plasticine Copying Task.*

The children were presented with a horizontal model (5-in. high) of each of the shapes, made out of ¼-in. (approx.) diameter plasticine strips. For each model, a set of plasticine strips was presented, corresponding in number and length to the straight and curved lines making up the pattern. Each child was asked to reproduce each model twice, with separate sets of strips, and his copy was traced on to a piece of paper by the experimenter. A line was drawn along the axis of each strip and the pattern copy thus reproduced was scored by projecting it on to a corresponding stencil pattern (10-in. high, with 1-in. 'tramlines', i.e., proportional to the tracing tramlines) by means of an epidiascope. When the distance of the stencil from the epidiascope had been adjusted so that the largest possible proportion of the child's copy was projected within the 'tramlines' of the stencil,' the proportion of his copy which fell within the 'tramlines' was measured and the better of his two attempts scored as on the tracing task (maximum score 600).

(*d*) *Pencil Copying Task.*

The children were presented with the six stimulus cards used in the matching task and were required to copy each pattern twice, once in each of two adjacent 2½-in. × 2½-in. squares on a sheet of paper. Each child's copies were scored by the projection technique used in the plasticine task, and he was scored for the better of his two copies (maximum score 600).

English Picture Vocabulary Test (EPVT).

This was given to each subject and scored according to the Manual (Brimer and Dunn, 1962). Crude scores were used.

Follow-up Study.

All the H group subjects and 19 of the 20 L group subjects were followed up in their schools after 1 year 5 months (CA 6–11 ± 3 months). They were individually tested by the same examiners on the following tests: (*a*) Pencil Copying Task (presented and scored as above); (*b*) Schonell Graded Spelling Test B (Schonell, 1956); (*c*) Daniels and Diack Sentence Copying Test (Daniels and Diack, 1960).

III.—RESULTS.

The data in Table 1 show that the H and L groups were clearly differentiated on the basis of their Bender Gestalt Test scores. The median scores of the H and L groups on the EPVT were significantly different. At age 5 : 6 a score of 11 corresponds to a standard score of 100. The H group's median score was thus higher and the L group's just lower than their age norms.

Since the H and L groups were selected as extreme groups the distribution of their scores on the tasks was often skewed. Non-parametric tests were consequently used in the statistical evaluation of the findings (Siegel, 1956). With one exception, the Kolmogorov-Smirnov Test was used to evaluate the differences between groups' scores. This test yields a coefficient K_D where the groups compared have equal N's, and X^2 where the N's are unequal. Handwriting was assessed by ranking, and the group differences evaluated by the Mann-Whitney U Test. The Wilcoxon Matched Pairs Test was used to compare test-retest scores.

Table 1 shows that the median scores of both the H and L groups were higher on the tracing than on the other tasks. The H group scored higher on the plasticine than on the copying task, but the L group's median scores on these two tasks were almost identical. These differences mentioned above are statistically significant. On the matching task both H and L groups have high median scores,

TABLE 1

COMPARISONS OF HIGH AND LOW GROUPS' SCORES.

Test	High Group		Low Group		Significance of difference
	Median	Range	Median	Range	
First Testing	N=20		N=20		
Bender	39	32—43	18	11—23	—
EPVT (Raw Scores)	20	7—30	10	4—19	$K_D=12^{**}$
Matching	6	5—6	5	1—6	$K_D=11^{**}$
Tracing	596·5[1,2]	587—600	583[4,5]	557—600	$K_D=11^{**}$
Plasticine Copying	513·5[1,3]	425—578	404·5[4]	180—511	$K_D=14^{**}$
Pencil Copying	408[2,3]	360—504	411[5]	224—485	$K_D=3$
Follow-up Testing	N=20		N=19		
Pencil Copying	453·5	341—524	428	332—522	$X^2=3{\cdot}94$
Handwriting (Ranks)	10	1—29	30	6—39	$U'=72^{***}$
Schonell Spelling (Raw Scores)	21	0—30	2	0—41	$X^2=11{\cdot}03^{**}$

[1] $K_D=8^{*}$
[2] $K_D=19^{**}$
[3] $K_D=11^{**}$
[4] $K_D=19^{**}$
[5] $K_D=20^{**}$

*—Significant at 5 per cent level (one-tailed).
**—Significant at 1 per cent level (one-tailed).
***—Significant at 0·1 per cent level (one-tailed).

Comparisons of the H and L groups' scores on each task shows the H group to be significantly better on all except the pencil copying task. The L group's score ranges are invariably larger than the H group's.

Analysis of Low Scores.

It was decided not to use correlation procedures to state the association between performance on the various tasks. Since the H and L groups were extreme groups, correlation measures would be at least partly determined by the group selection criteria. Instead, a cut-off score of 400 was arbitrarily chosen to select a group of low-scoring subjects on the tasks scored by the projection method. On the matching task a score of 4 was chosen to represent a similar point on the score range. The data in Table 2 show that 'poor' performance on the copying tasks may or may not be associated with poor performance on the matching task, but is never associated with poor performance on the tracing task. (None of the scores on the tracing task in fact came below the cut-off score.) The number of subjects making 'poor' scores on the matching task was very small, but the data suggest that these subjects also tended to perform poorly on the copying tasks.

Follow up.

Pencil copying task: The H group's improvement in median score after 1 year 5 months almost reaches statistical significance (Wilcoxon's T=63, P (one-tailed) <0·58), but the L group's improvement does not. Although the difference between the groups' median scores at retest increased, it did not reach significance.

TABLE 2

ANALYSIS OF LOW SCORERS' PERFORMANCE

	Test	Group	N	Scores: Matching Test: 1 Other Tests: 0–99	2 100–199	3 200–299	4 300–399	5 400–499	6 500–600
Subjects scoring under 4 on Matching Test.	Plasticine Copying . .	L	4	–	1	–	2	1	–
	Pencil Copying	L	4	–	–	1	2	1	–
Subjects scoring under 400 on Plasticine Copying Test	Tracing	L	9	–	–	–	–	–	9
	Pencil Copying	L	9	–	–	1	3	5	–
	Matching.	L	9	1	0	2	0	2	4
Subjects scoring under 400 on Pencil Copying Test	Tracing	H	7	–	–	–	–	–	7
		L	7	–	–	–	–	–	7
	Plasticine Copying	H	7	–	–	–	–	3	4
		L	7	–	1	0	3	3	–
	Matching	H	7	–	–	–	–	1	6
		L	7	1	0	2	0	1	3

Handwriting : The 39 subjects were ranked by three judges for the quality of their handwriting in the Daniels and Diack Sentence Copying test. The range of standards was wide, and the agreement of ranks (Kendall's tau) between each of the judges was over 0·9. The rankings made by the judge with whom the other two judges showed most agreement, were used. Table 1 shows that the H group was significantly better than the L group. All the lowest 10 rankings occurred in the L group.

Spelling: The H group was significantly better at spelling than the L group. Eight of the L group subjects made nil scores, compared with one of the H group. However, of these nine subjects with nil scores in spelling, seven could hardly write, and were in the lowest 10 rankings for handwriting. Nine of the H group, and two of the L group children had been taught i.t.a. and for these children, correct i.t.a. spellings were accepted. There was a tendency for these children to have good spelling scores, and this may have contributed to the superiority of the H group.

IV.—DISCUSSION.

Before discussing the results, it is necessary to account for the discrepancy between the projection and Keogh scoring techniques, as applied to the measurement of pencil pattern copying. Inferences about the interdependence of the component skills under investigation are based on the relative levels of performance as measured by the projection technique. Consequently, the meaning of these scoring criteria is a crucial issue.

The arbitrariness (or dependence on convention) in the application of any scoring method can be said to increase as a copy departs from identity with the model. In a previous study (Wedell, 1965), it was found that the projection method was particularly sensitive to errors of proportion. For example, on the Keogh scoring, a slightly rectangular copy of a square might achieve a maximum score, but on the projection criteria, it would receive only 75 per cent, since one complete side of the square would fall outside the stencil. These features make the projection scoring criteria more stringent, and this appears to account for the H group's failure, at first testing, to obtain a higher median score on the pencil copying tasks than the L group. However, the scoring criteria begin to discriminate at a slightly higher level of performance, as can be seen from the difference between the H and L groups at retest.

The H group's relative levels of performance on the various tasks corresponds to that found in the previously mentioned study (Wedell, 1964). The findings on visual discrimination, tracing, and free-hand pattern copying agree with those of Birch and Lefford (1967). The minimal errors on the visual discrimination and eye-hand co-ordination tasks show that these functions are not likely to have limited performance on the plasticine and pencil copying tasks. As intended, the plasticine task proved easier than pencil pattern copying. The plasticine task enabled the child to capitalise on his visual discrimination, since he was able to move the plasticine strips around until they ' looked ' right. Such self correction is, in principle, also possible in pencil pattern copying, but in practice, the child frequently abandons the attempt. Also the plasticine task requires a reproduction physically identical to a model, while there is an element of abstraction in the pencil copy of a pattern. It seems likely, therefore, that the plasticine task provides a relatively direct measure of spatial organisation of voluntary movement as a component skill.

Although there was a significant difference between the two groups' scores on the tracing task, none of the subjects in either group scored below 550. The L group's poor pattern copying could therefore not be attributed to impaired eye-hand co-ordination. By contrast, there was considerable variation in the L group subjects' visual discrimination performance. Seven subjects achieved maximum scores, but the analysis of low scorers indicates that in the case of three subjects, poor discrimination may have limited pattern copying. The L group's similar scores on the plasticine and pencil copying tasks suggests that impaired spatial organization may have had an important limiting effect on free-hand copying. None of the 9 low scorers on the plasticine task scored above 450 on the pencil copying task.

It is interesting to compare the L group's pattern of performance with that of the children aged 3 : 9 in the earlier study. The tracing scores of these younger children were only slightly better than their copying scores, and they made many errors on the matching task. A small proportion of the L group subjects thus appear to approximate to younger children with respect to visual discrimination, but none with respect to eye-hand co-ordination.

The H and L groups were significantly different in their performance on the EPVT. An analysis of low scores (the 10 subjects in the lowest quartile on the EPVT) showed performances throughout the score ranges on the perceptual tasks. At the same time, it is conceivable that some children with good verbal ability were able to use it to compensate for their difficulties on the Bender Test, and thus to qualify for inclusion in the H rather than the L group.

Little time was available for follow-up examination. The pencil copying task was readministered to check whether a significant difference would appear between the groups. A trend towards such a difference was indicated, and has already been mentioned. Tests of handwriting and spelling were included to assess the relevance of the component skills for educational achievement. The children's handwriting ranged from minimal legibility to exemplary handwriting. Although the superiority of the H group was highly significant, the ranges of rankings overlapped widely. While none of the H group subjects were in the lowest 10 rankings, the highest L group ranking was 6th. The lowest plasticine task score in the H group was 415, so that at age 5 : 6, higher performance on both this and the Bender Test appears to be predictive of adequate acquisition of handwriting. Low scores, however, do not imply the contrary, presumably because of differences in the effectiveness of teaching. If these implications for plasticine task performance were confirmed in a more extensive study, the task might provide a useful screening measure for younger children not sufficiently adept with pencil and paper to perform the Bender Test.

The effect of i.t.a. instruction confounded the differences between the H and L groups' spelling scores. Since spelling was measured by a written test, it was not surprising that 7 of the 9 subjects with nil spelling scores could hardly write. This finding does, however, indicate the potentially cumulative consequences of poor perceptuo-motor performance.

Although the H and L groups represent criterion groups selected from a larger sample, the small number of children included in these groups make it important to see the findings of the present study mainly as a guide for further investigation. Many other functions, if unimpaired, are likely to have potential compensatory effects on perceptuo-motor impairment, but, apart from the EPVT, no measures of these have been included. It must also be emphasised that the present findings are based on one particular scoring method, and although consistent with other studies, they need to be substantiated by different experimental approaches.

In conclusion, it has been shown that poor performance on the Bender Gestalt Test does not imply impairment of all the component functions involved, but impairment of the spatial organisation of voluntary movement appears to be common. In the diagnostic use of the Bender Test, awareness of the variety of skills contributing to performance would appear to be important.

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PERSONALITY PROFILES OF STUDENT TEACHERS

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SUMMARY. The 16 PF Questionnaire was administered to 149 female students of Homerton College at time of entry and 26 months later, prior to Final Teaching Practice. Small groups of students of 'high' and 'low' teaching ability were identified and their personality profiles compared. Four factors, conscientiousness (G), tough mindedness (I), confidence (O) and relaxed behaviour (Q4) significantly differentiated between the groups on both test occasions, and practicality (M) on the first occasion. Two-way analysis of variance on all possible pairs of factors revealed 15 interactions significant at the ·01 level. The findings suggest that particularly poor performances were encountered where tendermindedness (I+), high insecurity (0+) and tenseness (Q4+), respectively, are associated with a lack of conscientiousness (G –). Coefficients of test-retest stability over the period were calculated.

I.—INTRODUCTION.

VERNON (1953) has stated that " teachers are as diverse in their psychological traits as any other occupational group " and that " it is fallacious to talk of the teaching personality as something distinct and consistent " (p. 74). Yet there have been repeated attempts to relate personality variables to measures of teacher-effectiveness and to identify those personality characteristics which differentiate good from poor teachers. Cane (1967) has pointed out the difficulties inherent in attempts to define the concept of a 'good teacher' and mentions the lack of common criteria employed by even the most experienced observers. Nevertheless, reports written by tutors in colleges of education make frequent reference to personality characteristics and contain implications that certain attributes are more prevalent in 'good' than in 'poor' student teachers. Bibliographies dealing with work in the field of teaching effectiveness are extensive (Domas and Tiedeman, 1950; Evans, 1961) and the difficulties involved in this type of investigation are notorious. Halliwell (1965) reports lack of agreement between various measures of teaching efficiency; Wiseman and Start (1965) found little agreement between college assessment and later criteria of teacher success; and Tarpey (1965) has shown the existence of differing patterns of relationship between personality factors and teaching mark among student teachers in different colleges. Other investigators (Warburton *et al.*, 1963) have found the 16 PF test of Cattell to be a fair predictor of teaching mark in that conscientiousness (G+), tender mindedness (I+) and control (Q3+) exhibited relationships significant at the ·05 level with teaching ability. This they regarded as of sufficient promise to suggest their use as part of selection procedures. Work reported by Barr *et al.* (1961) bears similarity to these findings in that conscientiousness (G+), control (Q3+) and practicality (M –) were positively related to teaching success; but those presented by Start (1966) are at variance with these investigations. He showed teachers of high ability to be less controlled and less practical than their low ability counterparts.

Perhaps the most notable finding to emerge from these and other studies is the lack of a consistent pattern of relationship between personality and teaching ability. Methodological differences, the subjective non-statistical nature of teaching grades and the complexity of the teaching process play a part in this.

II.—Plan of the Investigation.

Aims. The study reported in this paper set out (*a*) to compare the personality characteristics of parallel groups of student teachers of 'high' and 'low' teaching ability; (*b*) to investigate the stability of response to the 16 PF Questionnaire by students over the period between time of entry to college and final teaching practice.

Subjects and materials. The 16 PF Questionnaire, Form A, was taken by 149 female students of Homerton College who began their three-year course in September, 1965, and by 154 during the first week of November, 1967, immediately prior to final teaching practice, the five extra students being late entrants. In addition, scores were obtained for all students on the Valentine Reasoning Test.

Procedure. All students were graded on the five-point teaching scale of the Cambridge Institute, but since experience led one to expect a negatively skewed distribution with the attendant difficulty in obtaining sufficiently large numbers in the extreme categories, tutors were asked to use an additional internal five-point scale for research purposes only as follows:

A An outstandingly good practice.
B. A good practice.
C An average practice.
D A below-average practice.
E A poor practice—not a failure, but reserved for the poorest students.

In an attempt to ensure consistent evaluation of teaching ability, four experienced tutors were relieved of supervisory duties to act as moderators across the categories.

III.—Results.

The distribution resulting from the above procedure was as follows: Category A, 23 students; B, 63; C, 45; D, 15; E, 8. In order to obtain a 'low' teaching ability group, categories D and E were combined (N=23, Mean Age 23 years 7 months, SD 6 years 9 months). Students graded A were described as showing 'high' teaching ability (N=23, Mean Age 22 years 9 months, SD 5 years 8 months. Grades B and C constituted the intermediate group (N=108). Similar data were available from the September, 1965, testing session for 22 of the 'high' and 19 of the 'low' ability. Table 1 shows the mean scores and standard deviations of all three groups on those factors in the 16 PF Questionnaire for which significant differences between means of 'high' and 'low' teaching ability group exist ($P < \cdot 05$).

TABLE 1

Mean Scores on 16 PF Factors of Students rated 'High,' 'Low' and 'Intermediate,' on Teaching Ability (Standard Deviations in Brackets).*
November, 1967

Teaching Rating	High (N=23)	Intermediate (N=108)	Low (N=23)	Significance of Difference		
				High Low	High Inter	Low Inter
Factor G	13·09 (3·23)	11·23 (3·74)	9·91 (3·56)	< ·01	< ·05	N.S.
I	11·74 (2·49)	11·27 (2·64)	13·96 (2·60)	< ·01	N.S.	< ·01
O	9·83 (3·62)	11·36 (3·81)	13·83 (3·59)	< ·001	N.S.	< ·01
Q4	12·74 (3·75)	13·63 (4·86)	15·26 (4·83)	< ·05	N.S.	N.S.

September, 1965

Teaching Rating	High (N=22)	Intermediate (N=108)	Low (N=19)	Significance of Difference		
				High Low	High Inter	Low Inter
Factor G	14·32 (3·62)	12·17 (3·77)	10·58 (3·56)	< ·01	< ·05	N.S.
I	12·23 (1·88)	12·12 (2·76)	14·05 (1·67)	< ·01	N.S.	< ·01
M	12·50 (2·71)	12·32 (3·43)	14·94 (3·26)	< ·05	N.S.	< ·01
O	11·13 (2·79)	11·91 (3·30)	13·74 (3·40)	< ·05	N.S.	< ·05
Q4	12·36 (5·56)	13·69 (4·43)	15·84 (3·45)	< ·05	N.S.	< ·01

* NOTE—Only those factors which showed significant differences between groups are reported.

Means and standard deviations for primary and secondary students were calculated separately but no significant differences were found between them for the 1965 or 1967 data.

Having demonstrated the main effects, an analysis of variance was carried out to determine the interaction effects of all possible pairs of factors on the 1967 data. This revealed 15 interactions significant at the ·01 level, with lack of conscientiousness (G –) interacting at $P < \cdot 001$ level with tendermindedness (I+) high insecurity (O+) and tenseness (Q4+) respectively.

Pearson product-moment coefficients of correlation were calculated to investigate the test-retest stability after the 26 months between September, 1965, and November, 1967, and coefficients are shown in Table 2.

TABLE 2

16 PF STABILITY COEFFICIENTS · TEST-RETEST AFTER 26 MONTHS.

Factor	A	B	C	E	F	G	H	I	L	M	N	O	Q1	Q2	Q3	Q4
Form A N=149	·37	·46	·54	·63	·66	·57	·69	·39	·51	·45	·40	·56	·50	·47	·50	·57

Scores on the Valentine Reasoning Test were as follows:

'High' ability mean 34·14; SD 15·35. 'Low' ability mean 39·10; SD 16·34. 'Intermediate' ability mean 36·24; SD 15·88. Differences were not significant.

IV.—DISCUSSION.

Table 1 identifies four personality factors which distinguish between student teachers of high and low teaching ability. It will be noted that the data as a whole show those characteristics associated with low teaching ability to be most clearly differentiated.

Poor teachers were less conscientious and persistent (G –) than their successful counterparts, tender-minded and sensitive (I+), prone to feelings of insecurity and timidity (O+) and liable to be tense, excitable and restless (Q4+). It is interesting that, whilst the finding in respect of conscientiousness (G) agrees with the report by Warburton *et al.* (1963), that in respect of tender-mindedness (I) is in the reverse direction. Their data show a positive, significant correlation between tender-mindedness and final teaching mark, and they suggest that this quality is both more highly valued by and more typical of the European than of the North American culture. It appears, however, in the present sample that higher than average sensitivity militated against a high teaching grade.

Comparison of the 1967 data with the 1965 data (Table 1) shows that differences between good and poor teachers were evident on the same four factors and in the same direction on both occasions. In addition, the factor for unconventional behaviour and carelessness in practical matters (M), on which the low ability group obtained an above-average score, differentiated between the groups on the earlier occasion.

An interesting finding has emerged with the factor of apprehension (O). At the time of entry this differentiated between the mean scores of the ' high ' and ' low ' groups at the ·05 level of confidence, but in 1967, immediately prior to final teaching practice, the level of significance obtained was greater than ·001. Inspection of the tables shows that the shift has occurred in the case of teachers of ' high ' ability, whilst the mean score of the ' low ' ability group indicates no change in level of apprehension and worry.

The two-way interaction analysis of all possible pairs of factors on the 1967 data revealed that 15 interactions were significant beyond the ·01 level and show that where high sensitivity (I+), high insecurity (O+) and tenseness (Q4+) respectively are associated with lack of conscientiousness (G –), particularly poor performances were recorded. Teaching practice is commonly held to be an anxious period for students, and since the extremely apprehensive person is reported by Cattell to be over-fatigued by exciting situations, unable to sleep through worrying, feeling inadequate to meet the rough daily demands of life, and easily downhearted, it is not surprising that such a syndrome should be associated with a poor teaching practice performance. High level insecurity is also stated to be strongly weighted against successful leadership in face to face situations. High sensitivity is associated with a certain impracticality in general affairs, slowing up group performance and the making of morale-upsetting remarks. Where these characteristics are accompanied by attitudes which are casual, rule-evading and lacking in effort typical of a G – score, the poor teaching grade becomes understandable.

Second-order factors of anxiety and extraversion were calculated for the 1967 data and whilst the anxiety score was high for the low ability group that for extraversion was average for both groups. Scores for the entire group seemed much closer to the U.S. norms than those of practising teachers presented by Start (1966), though the sample employed in the current investigations was uncomplicated by the sex variable.

In the light of the descriptions of the traits given by Cattell it is notable that neither warmheartedness (A) nor spontaneity (H) revealed differences between the two groups, for he has stated that A+ subjects " adapt cheerfully to a lot of compromises with human failings " and H+ individuals show " ability to face wear and tear in dealing with people and gruelling emotional situations." Cattell has shown U.S. teachers to rank high on warmheartedness, and Lamke (1951) has reported both factors to be of significance in distinguishing between good and poor teachers. The findings in the current investigations are in line with recent British research in respect of these factors (Start 1966, Warburton *et al.* 1963).

Table 2 shows coefficients of test-retest stability after 26 months of the College course. All are significant at the ·01 level but, as may be expected, are considerably lower than the short-term reliabilities and two-month stabilities involving Forms A and B presented in the Manual. Cattell has claimed that a comparison between short-term reliability and stability over the longer period brings evidence of the stability of the personality trait, not the test, and he points out that some factors are more susceptible to environmental influences than others (F, M. Q3 and Q4). However, inspection of the coefficients does not suggest that the factors specified by Cattell show greater fluctuations than the remainder.

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RESEARCH NOTE

DIVERGENT THINKING ABILITIES IN SECONDARY SCHOOLS

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Summary. In a previous study of primary schools, children in 'informal' schools scored higher on tests of divergent thinking than children in 'formal' schools. A parallel study of two 'informal' and two 'formal' secondary schools failed to yield a similar result. Some possible explanations of this finding are put forward.

Convergent ability was shown to be more closely related to social class than divergent ability.

I.—Introduction.

In an earlier experiment Haddon and Lytton (1968) found that children in two primary schools rated as 'informal' (stressing child-initiated learning) did better on five out of six divergent tests than children from two schools rated as 'formal' (stressing traditional learning). The present experiment, using the same tests, took the investigation from the primary field into the secondary, and there attempted to verify the hypothesis of a differential effect of differing school climates In addition it investigated the inter-relationships between divergent tests, verbal reasoning tests and social class.

Two secondary modern schools and two grammar schools were chosen ; within each pair of schools socio-economic background was very similar and the mean VRQ's showed no significant difference. The 143 children (97 boys and 46 girls) tested were 14 years old and in their third year in the school. By consensus among college or department of education lecturers, and local authority inspectors, one grammar school and one secondary modern were allotted to the 'formal' category, and the other pair to the 'informal' category. However, it was noted at the time the tests were given (and not only after the results were known) that the schools did not differ markedly in overall climate. The difficulty here is that teaching approach in a secondary school is uniform for a department rather than for the school ; a department may be 'formal' or 'informal' without this permeating the whole school. The experiment was persevered with, as it was impossible to find better contrasted schools that were at the same time matched for socioeconomic background.

The tests used were those described in Haddon and Lytton (1968).

II.—Results.

(*a*) *Types of school.* The results of the divergent thinking tests did not reproduce the sharp differentiation that was noted in the earlier investigation in primary schools (Table 1). There were only two significant differences : the Imaginative Stories Test in the predicted direction and the Incomplete Circles Test in the opposite direction.

Since the tests (except for Test 2, which had been adapted from its previous version) were scored in exactly the same way as in the earlier study it is of interest to note the movement of raw scores from age 11 to 14. The only test for which a marked increase in scores occurred was Test 6 ('Imaginative Stories') ; all the others showed only slight increases or decreases. It is possible that this reflects the drop in divergent productivity that Torrance (1965) noted around 13 years.

TABLE 1

COMPARISON OF MEAN TEST SCORES (RAW SCORES).

	Formal Schools			Informal Schools			Differ. of Combin'd Means Informal –Formal	't' for difference Combin'd means
	A Mean	C Mean	Combin'd Mean A and C	B Mean	D Mean	Combin'd Mean B and D		
VRQ	118·4	103·8	111·13	118·8	105·3	112·05	0·82	N.S.
Test 1	12·97	11·89	12·35	10·41	10·97	10·78	—1·57	2·612*
Test 2	17·40	17·44	17·43	17·10	16·85	16·94	—0·49	N.S.
Test 3	7·96	6·67	7·20	6·86	8·07	7·65	0·45	N.S.
Test 4	12·21	10·38	11·13	10·68	10·09	10·29	—0·84	N.S.
Test 5	12·68	11·59	12·03	11·22	10·81	10·95	—1·08	N.S.
Test 6	15·22	15·72	15·52	21·45	16·40	18·14	2·62	2·72*
N	32	47	79	22	42	64		

* Significant at 1 per cent level.

Test 1 : Incomplete Circles.
Test 2 : Vague shape of Dots.
Test 3 : Block Printing.
Test 4 : Uses for shoe box.
Test 5 : Problems in taking a bath.
Test 6 : Imaginative Stories.

TABLE 2

CORRELATION OF VRQ AND DIVERGENT THINKING TESTS.

All schools. Sub-groups based on VRQ ranges.		
	N	r
Full range of VRQ (87–137)	143	·170
VRQ 116+	43	·037
VRQ 101+*	114	·141
VRQ 100 and below	29	—·058
* This includes category VRQ 116+		
All schools. Sub-groups based on Divergent Test ranges.		
	N	r.
Full range	143	·170
Divergent Score 40·5+	72	·207
Divergent Score 40·4—	71	·040

(*b*) *Relationships between divergent thinking tests, verbal reasoning tests and social class.* With the present population the overall VRQ /Divergent Test correlation over the full VRQ range was much lower (·17) than in the earlier study, but far from increasing with the lower VRQ group, the correlation for this group practically vanished and, in actual fact, became negative (Table 2). The correlation between the verbal and non-verbal divergent tests (·43) was satisfactorily higher than the correlation between VRQ and divergent tests, thus providing some justification for considering divergent and convergent thinking as separable, though complementary aspects of intellectual functioning. But the study did not support the ' threshold theory ' that convergent and divergent thinking become differentiated mainly at higher levels of general cognitive ability.

The correlation of social class (determined by father's occupation) with VRQ (·58) was considerably higher than with total divergent test scores (·26) suggesting that these latter tests are less dependent on environmental influences.

III.—CONCLUSIONS.

The negative result of the comparison between the ' types ' of schools may be due to the lack of contrast between the schools, but it may also be that the effect of a more flexible approach to learning are not reflected in the performance of 14-year-olds in these divergent tests, perhaps because of the limitations of the tests (cf. Walker, 1967). The result should therefore not be interpreted as a negative verdict on ' informal ' schools, but it illustrates the difficulty of this kind of investigation in the more complex secondary school organisation.

The low correlations between VRQ and divergent tests suggests that these are two distinguishable aspects of intellectual ability. *Convergent* ability seems to be more subject to the influence of social class than divergent ability.

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SUMMARIES OF RESEARCHES REPORTED IN DEGREE THESES

THE EFFECTS OF SECONDARY SCHOOL ORGANISATION ON THE DEVELOPMENT OF INTELLIGENCE, ATTAINMENT IN ENGLISH AND ATTITUDES TO SCHOOL

By A. GRIFFIN

(Abstract of thesis submitted for the degree of M.Ed., University of Manchester)

AIM: To compare the results of tests of verbal reasoning and attainment in English taken at the age of 11+ with the results of similar tests taken at the age of 14+ by children in secondary modern, grammar and comprehensive schools, and to compare the attitudes to school of these children at the age of 14+ in the three types of school organisation.

PROCEDURE: 586 children were tested in three grammar, three comprehensive and six secondary modern schools in Staffordshire. Moray House English Test (Adv.) 2 and Manchester General Abilities Test (Senior) 2 were used at the age of 14+ to calculate differences in verbal reasoning and in English attainment when compared with Moray House tests taken at 11+. Attitudes to school were measured by a Likert-type attitude-to-school scale, three multiple-choice opinion statements and a direct question.

Analysis of variance was used to investigate the effects of sex, level of ability, type of school organisation and schools within type of organisation for all factors. Analysis of covariance was used to rank schools for boys and for girls for the difference in verbal reasoning and English attainment scores.

RESULTS AND CONCLUSIONS: At the highest level of ability, there were no significant differences between comprehensive and grammar schooools for the factors, development of intelligence and attainment in English. Children in comprehensive schools recorded better attitudes to school than did children in grammar schools, and girls in comprehensive schools appeared to find school a much more congenial place than did girls in grammar schools.

At the border-line level of ability (children within this group, IQ 101–109, appeared in all three types of organisation) boys in comprehensive schools recorded higher scores than boys in secondary modern schools for development of intelligence. Girls in secondary modern schools and in comprehensive schools recorded better attitudes to school than did girls in grammar schools.

For children of average and below-average ability, comprehensive schools appeared to provide a more stimulating atmosphere than secondary modern schools. Attitude scores in comprehensive schools appeared to be more homogeneous than scores in secondary modern schools, poor attitudes of children at the lowest level of ability being responsible for the diversity of scores in some secondary modern schools.

Boys and girls in comprehensive schools, at each level of ability, expressed the wish to stay at school longer than did their counterparts in grammar and secondary modern schools, but the differences were not significant at the 5 per cent level.

(Manuscript received 21st October, 1968)

THE ATTITUDES OF WEST INDIAN AND ENGLISH ADOLESCENTS IN BRITAIN

By D. HILL

(*Abstract of thesis submitted for the degree of M.Ed., University of Manchester*)

Aim: To measure and compare the attitudes of English and West Indian adolescents towards certain conceptual objects of presumed importance in their social and personal development. The main areas of interest were in attitude towards Home, School and Community, and their inter-relationships.

Procedure: 400 English and West Indian boys and girls, 100 in each group, aged 14–15 years, drawn from six secondary modern schools in the West Midlands, judged each of 13 concepts (e.g., myself, father, a neighbour I would like to have) on scales taken from Osgood's three dimensions. Reading ability and social class of the subjects were controlled. Preliminary analysis confirmed the factorial composition of the scales. For each subject one evaluative score was obtained on every concept and the scores were intercorrelated and factor analysed for each group separately. Five principal components were extracted in each case and the axes rotated successively to Varimax and Promax criteria. For each group two second-order factors were obtained from the correlations between Promax factors. Mean score differences among groups were also considered.

Results and Conclusions: Girls, particularly West Indians, generally express more favourable attitudes than boys. West Indian boys and girls have similar attitudes to all conceptual objects, unlike their English counterparts. Although both groups of girls are primarily concerned with establishing good future personal relationships, as opposed to the boys who are more ambitious for themselves, it is the West Indians, as a group, who identify themselves more strongly with the former attitudes. The West Indians' self-assessment, particularly that of the girls, is higher than that of the English groups. The West Indians also have less regard for parents and home, but a more favourable attitude towards education, than the English adolescents. All groups, particularly the West Indians, are aware of skin colour, expressing in-group preferences. There is evidence of inter-racial tolerance but some aspects of colour prejudice can be defined.

(*Manuscript received* 21*st October*, 1968)

THE GROWTH OF MATHEMATICAL THINKING DURING THE SECONDARY SCHOOL YEARS, WITH PARTICULAR REFERENCE TO PROBLEM SOLVING

By E. G. LAW

(*Abstract of thesis submitted in part fulfilment of requirements for the degree of M.Ed., University of Birmingham*, 1968)

Aim: The main purpose was to investigate the relationship between problem-solving ability and chronological age, among grammar school boys aged from 11 to 16 years. Two further comparisons of problem-solving ability were made: between upper and lower mathematical sets, where these existed; between 'express' streams (4 years to 'O' level) and 'normal' streams (5 years to 'O' level).

Procedure: The school was a highly selective boys' grammar school, the lowest IQ being around 120. Altogether 492 problem situations were studied, so that each boy following the 'O' level course attempted at least one problem. All the boys took Mathematics as an 'O' level subject. There were 10 problems, varying from those similar to text-book problems, to others whose solution was possible by the use of common-sense and ingenuity rather than by resort to standard 'O' level methods. An example of the latter would be to explain why a number of the form abc, abc is always divisible by 13.

The method of 'talking-out' was adopted. The subject attempted the problem in writing while at the same time voicing his thoughts,. The experimenter's function was that of an observer and recorder, and he intervened only to clarify doubtful verbalisation or to encourage further effort. In no case was help given during the attempt. The atmosphere of a test situation was avoided as far as possible, and no time limit was imposed. Each attempt was scored as Pass or Fail, according as the essence of the problem was, or was not, appreciated by the subject. The criterion of success was not simply 'getting the answer,' but giving an explanation and seeing the point of the problem.

RESULTS: In each case Chi-square was used to test the null hypothesis, that is that no difference exists between (1) older and younger subjects of this age-group, (2) upper and lower mathematical sets, (3) 'express' and 'normal' steams. The following results were obtained:

(1) $n=492$. $\chi^2=2{\cdot}11$ for 1d.f. $0{\cdot}1<P<0{\cdot}2$
(2) $n=212$. $\chi^2=2{\cdot}77$ for 1d.f. $0{\cdot}05<P<0{\cdot}10$
(3) $n=418$. $\chi^2=9{\cdot}96$ for 1d.f. $0{\cdot}001<P<0{\cdot}005$

CONCLUSIONS: If the 5 per cent level of significance is taken as the criterion, then only in case (3) are we able to reject the null hypothesis, and say that the 'express' stream does differ from the 'normal' stream in the ability to solve the problems. The allocation of boys to the express stream was made by the headmaster on the basis of high IQ, modified in particular cases by primary head-teachers' comments. It would appear then that some relationship exists between problem-solving ability and IQ, and this is hardly surprising. What is perhaps surprising is that the upper mathematical sets, and the older boys, do not show to greater advantage. Neither the clear superiority of the upper set in terms of school examinations, nor the greater mathematical experience of the older boy, seems to confer a definite advantage in a problem-solving situation. One is bound to ask whether the teaching of the subject is too little concerned with thinking, and too much concerned with the learning of techniques; and to wonder whether such an emphasis is justified.

The results here reported must, of course, be viewed in the light of the limitations imposed by the choice of both the subjects (in terms of age, sex, and intelligence) and the problems themselves.

(*Manuscript received* 18*th November*, 1968)

THE SOCIAL ASSIMILATION OF ADOLESCENT BOYS OF EUROPEAN PARENTAGE IN WESTERN AUSTRALIA

BY A. G. DOCZY

(*Department of Education, University of Newcastle, Australia*)

(*Abstract of thesis submitted for the degree of Ph.D., University of Western Australia,* 1967)

AIM: The overall aim of the study was to gain some insight into the variables pertaining to the social assimilation of two groups of 14—15-years-old 'New Australian' boys (children of immigrants).

SAMPLES: Two groups of 'New Australians' were studied: (1) boys who were immigrants themselves (N=59) and (2) second-generation boys, i.e., Australian-born children of immigrants (N=22). A third group, the control group, consisted of Australian-born children of Australian-born parents (N=81). The immigrant boys had been in Australia for at least six years. The subjects were enrolled in the same school-grade, in four different secondary schools. In order to avoid added complexity resulting from the interaction of psychological problems relating to immigrant status and to the ' broken home ' situation, only boys living with both natural parents were included in the samples. The groups were matched on age, intelligence level, age of parents, age-difference between parents and father's occupational level.

METHOD : Four questionnaires, two interview schedules and five teachers' rating scales were used. The analysis of the results proceeded in four major steps :

(1) *Degree of assimilation.* Within the framework of Taft's assimilation model (Taft, 1965), a set of hypotheses was tested by comparing the samples on a large number of variables (components of assimilation or ' assimilation facets '). It was predicted that the New Australians would differ significantly from the Australians, the immigrants more than the second-generation boys. The predictions concerned both the subjects' perception of their own assimilation and their ' actual,' i.e., more objectively assessed, assimilation.

(2) *Stages of assimilation.* Scalogram analysis was used to test two major hypotheses about the modal ' stages ' (temporal sequence patterns) of the immigrant subjects' assimilation. The first predicted the sequence, " *perceived acculturation* (the acquisition of cultural knowledge and skills) preceding *satisfaction with one's life* preceding *identification with the host peer group* " ; the second the sequence, " *actual* acculturation—satisfaction—identification."

(3) *Correlates of assimilation.* Variables hypothesized to be ' correlates ' (as distinct from ' components ' or ' facets ') of assimilation were studied by means of correlational analysis and comparing the samples on variables that lent themselves to comparison.

(4) *Problems of New Australian boys.* These were studied by analysing the responses to a non-structured questionnaire.

RESULTS : (1) *Degree of assimilation.* While the second-generation group differed less from the control group than did the immigrant group, both New Australian groups were far from being fully assimilated. Thus, the findings were at variance with the widely held view of rapid and complete assimilation of immigrants' children.

(2) *Stages of assimilation.* The results supported the hypothesis predicting the " perceived acculturation—satisfaction—identification " sequence. The second major hypothesis was found to be untenable.

(3) *Correlates of assimilation.* (*a*) ' Emotional adjustment ' was found to be the best single non-facet index of assimilation. (*b*) There was only a moderate (positive) relationship between the subjects' and their parents' assimilation (the latter was assessed *via* the subjects' responses).

(4) *Problems of New Australian boys.* The responses uncovered four problem areas not considered in the design : employment, adjustment to the physical environment, social control, and interaction with girls.

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(*Manuscript received 25th November*, 1968)

LANGUAGE AND SOCIAL CLASS AMONG GRAMMAR SCHOOL CHILDREN

BY D. A. SMEDLEY

(Abstract of thesis submitted for the degree of M.Ed. in the University of Nottingham, 1968)

AIM: To study the relationship between the social background of 12-year-old children in a mixed grammar school and their linguistic ability as revealed by written compositions; particularly, following Bernstein's hypothesis, to examine the evidence for different linguistic codes.

SUBJECTS: The whole first-year intake of one mixed grammar school. 69 of the children could be clearly classified, on the basis of father's occupation, as manual working-class or upper and middle middle-class. Three levels of verbal IQ were distinguished: high (134 and above), medium (119–132), and low (108–118). Finally, the sex difference completed a division into 11 groups (there was no instance of a middle-class girl, ' low ' IQ) ranging in size from 14 to 2.

PROCEDURE: In the final term of their first year the children were asked to do four pieces of written work on subjects chosen to give a range of writing styles

45 linguistic features were chosen for analysis, mainly those which were expected to throw light on Bernstein's hypothesis. They may be roughly classified: (*a*) Quality of vocabulary; (*b*) Parts of speech; (*c*) Qualification (adjectival and adverbial) and elaboration (of the verb stem); (*d*) Syntax.

For each linguistic feature, comparisons were made, using the Mann-Whitney U test, between pairs of groups differing in one respect only. (Thus Middle-class boys of high IQ *v.* Working-class boys of high IQ is a comparison of social-class difference.)

For each linguistic feature, the probabilities associated with the U statistic were combined for all social-class (or sex, or IQ) comparisons, to see if there was a significant overall effect of social-class (or sex, or IQ). The results given below are based on these overall comparisons.

A two-factor analysis of variance, sex against social-class, was carried out on the seven features which seemed to show a significant social-class difference.

RESULTS: 1.—Social-class differences. The only features to show significant differences were syntactic. There was strong evidence for the superiority of middle-class children in handling the structural resources of language. Nearly all the comparisons were in the predicted direction, and the following features showed differences significant at the 5 per cent level: sentences with at least one subordinate clause ($p < \cdot 005$); sentences with more than one subordinate clause ($p < \cdot 05$); adverb clauses ($p < \cdot 05$); number of subordinate clauses/all clauses ($p < \cdot 025$); all phrases and clauses/words ($p < \cdot 001$); Loban index of subordination, a measure of sentence complexity ($p < \cdot 0025$); average sentence length ($p < \cdot 025$). These results were confirmed by the analysis of variance.

2.—Sex differences. There were consistent differences in favour of girls on a majority of the features, several being significant at the 5 per cent level.

3.—IQ differences. Higher IQ groups were markedly superior in quality of vocabulary, qualification, and use of the passive voice. Interestingly, there was no evidence of an IQ difference on syntactic features, though it should be remembered that the overall range of IQ was rather narrow.

DISCUSSION: This investigation lends support to Bernstein's hypothesis with regard to syntax, but not with regard to other features. The middle-class children appeared to use more complex and more varied sentence structures. There may be a connection between the ability to handle an elaborated syntactic code and other cognitive

abilities, particularly those involved in formal reasoning. A limited syntactic ability might therefore be a contributory factor to the relative decline, during adolescence, in the educational performance of intelligent working-class children. At the same time there was little evidence in this investigation of a sharp division between children who have access to an elaborated code and those who do not. More research is needed, possibly using different methods of linguistic analysis, to reveal the operation of linguistic codes in relation to variables other than social class, such as age, sex, intelligence, and linguistic context.

(*Manuscript received 20th December*, 1968)

THE RELATIONSHIP BETWEEN SPATIAL ABILITY AND PERFORMANCE ON SOME PIAGETIAN TESTS

BY R. W. MYCOCK

(*Abstract of thesis submitted for the degree of M.Ed., University of Manchester*, 1968)

AIMS: To discover the relationship between performance in certain standardised tests and some Piagetian tests of spatial and logical ability; to ascertain whether factors other than a general factor, and in particular a spatial factor, contributed to performance in the several tests; to indicate any significant difference between the performance of boys and girls; to indicate an order of difficulty for the Piaget tests and to show any tendency to change the level of performance between items within each Piaget test.

SAMPLE: 30 boys, 30 girls, a 50 per cent random selection of the total 9-year-old population of a junior school in Yorkshire, mean age 9 : 6·1.

TESTS: Two NFER tests: Primary Verbal 1, Non-Verbal 5. SRA Primary Mental Abilities Battery: Perceptual Speed, Reasoning—figure grouping, Reasoning—words, Space, Verbal Meaning—pictures, Verbal Meaning—words. Ten Piagetian tests, administered individually: Haptic perception, Similarity of triangles, Similarity of shapes by classification, Horizontal and vertical co-ordinates, Linear and circular order, All and some, Classification—nesting, Multiplicative classification—matrices, Intersection—matrices, Multiple seriation. In the case of the Piagetian tests a clearly defined experimental procedure was laid down for each test; more than one item was included in each experimental situation; and a carefully constructed scoring procedure was set out. While each of the tests is based on one of the situations appearing in Piaget and Inhelder 1956 (first five based on Chapters 1, 12, 12, 13 and 3 respectively) or in Inhelder and Piaget 1964 (second five based on Chapters 3, 4, 6, 6 and 10 respectively), the version used in this study often departs quite radically from that of the original, substituting unambiguity of procedure and replication of analagous items for the relatively loose clinical method.

RESULTS: 1.—The two NFER tests showed the expected high or substantial correlation with the majority of the remaining tests. Surprisingly, the SRA Space Test had no high correlation with any of the Piaget spatial tests.

2.—In a factor analysis of the 18 tests plus age, four factors were extracted by the method of principal components. The first three were identified as: I, a general ability factor; II, variation due to age; III, a spatial factor of a specific kind involving perception of similarity in geometrical figures.

3.—There was no significant difference between the performance of boys and girls on any test.

4.—The reliability coefficient for the Piagetian tests, correlated for length (each test being considered as one item within the larger test constituted by the Piagetian battery as a whole) was 0·89.

5.—The apparent order of difficulty of the Piaget tests was :

Order	Test	No. of subjects Operational	Non-Operational
1.	Horizontal-vertical	54	6
2.	Linear and circular order	47	13
3.	All and some	45	15
4.	Classification—nesting	42	18
5.	Multiple seriation	38	22
6.	Haptic perception	34	26
7.	Intersection—matrices	30	30
8.	Similarity—classification	23	37
9.	Multiplicative classification	14	46
10.	Similarity—triangles	4	56

The McNemar Test produced evidence of a significant tendency to change from non-operativity to operativity or *vice-versa* between items in all Piaget tests except Test 14 (All and some) and Test 18 (Multiple seriation). The two most important reasons for the changes appear to be difference in item content rather than form, and the effect of practice in earlier items on performance in later items.

The McNemar Test proved a powerful instrument to test the significance of time lag effects, and should be a necessary preliminary step before undertaking a psychological examination of the underlying reasons for test or item difficulty.

Piaget has at times insisted on a polarisation of content as between situations featuring discrete materials, where logical structures operate on a logical content, and spatial and geometrical materials, where the same structures operate on a continuous ' sub-logical ' content. The results of the present study suggest that this distinction, though logically clear, may have little psychological relevance.

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(*Manuscript received 30th December*, 1968)

CRITICAL NOTICE

WHAT IS INTELLIGENCE?

BY SIR CYRIL BURT

BUTCHER, H. J. (1968). *Human Intelligence: Its Nature and Assessment.* London: Methuen, pp. 343, 55s.

Professor Butcher in his Introduction tells us that he has three aims in view: first, to treat intelligence, not as an isolated speciality, but as a basic topic of general psychology; secondly, to provide an up-to-date survey of the more important views and researches in this subject and to indicate where they can be found; thirdly, " to swing the pendulum against current opinion in so far as this holds that ' intelligence ' is an out-of-date concept." According to the publishers, " this is the only book which presents a really comprehensive view of current psychological attitudes to intelligence." In point of fact there have been two recent books with similar titles—Wiseman's Pelican on *Intelligence and Ability* and Guilford's imposing work on *The Nature of Human Intelligence.* The former, however, consists only of ' readings ' from various authors from Galton onwards, with very brief explanatory comments by Wiseman himself; the latter is a technical work, designed for the specialist and presenting the author's own " structure-of-intellect theory," though he too seeks " to put intelligence within the main stream of general psychological theory." Professor Butcher, on the other hand, has planned his volume " primarily as a textbook for students in University Departments of Psychology and Education and in Colleges of Education."

The opening chapter, on " The Concept of Intelligence," starts with a short historical review of the problems which gave rise to such a notion. He points out that, when Spencer, Galton, and Binet revived the old Latin name ' intelligence ' to designate the new concept which they wished to introduce, the word was almost unknown in popular parlance. He carefully warns the reader against supposing that the noun denotes an identifiable ' thing '—a ' gift ' or ' talent,' which parents hand on to their offspring much as they might bequeath a sum of money or a set of books; it is rather a ' dispositional property,' like the strength of the oak or the fertility of rabbits. For brevity he adopts the American term, and calls it a ' trait.'

Among ' psychological traits,' we are told, " the most widely accepted distinction is between traits of personality " (i.e., what older writers called ' affective and conative characteristics ') and ' traits of ability ' (i.e., ' cognitive ' characteristics, which include practical as well as intellectual efficiency). Both Spencer and Galton took this ancient antithesis as their first step in classifying ' traits,' and the novel feature in their theory was the distinction between a *general* ability (which Spencer termed ' intelligence ') and a variety of more specialized abilities, roughly corresponding with the traditional ' faculties.' During the evolution of the species, and again during individual development, the latter (according to Spencer) have differentiated out of the more general quality of intelligence, and have formed a hierarchical structure of increasingly specific capacities. Galton's chief contribution consisted in the attempt to demonstrate, by analysing the pedigrees of genius, that individual differences in ' general capacity ' are largely inherited. " Grasping the nettle firmly," as Professor Butcher puts it, we are thus led to an abstract concept defined in terms of three successive distinctions, namely, ' innate, general, cognitive ability.' We cannot keep repeating such a cumbersome phrase each time we refer to this hypothetical concept. Galton, Binet, and their earlier followers therefore adopted Spencer's term ' intelligence.' As with so many other technical expressions, it filtered into the vocabulary of everyday life, and thus came to be used to denote a person's general intellectual efficiency, which is largely the result of experience and learning. Butcher suggests borrowing Hebb's descriptions—' Intelligence A ' and ' Intelligence B,' which he refers to as designating " two different kinds of intelligence"; they really indicate two different ways of using the word. It would, I think, be much clearer to speak of 'genotypic' and 'phenotypic' intelligence—descriptions which Butcher himself has adopted in another publication.

The arguments of these earlier pioneers, however, were far from conclusive; and Galton's views were almost immediately attacked, particluarly by the associationist school—the forerunners of the modern behaviourists. The first line of criticism was directed against the notion of a new superfaculty called 'general ability.' This, as we have seen, was originally based on a somewhat speculative theory about the structure of the human mind. Accordingly, Professor Butcher's next chapter deals with 'The Structure of Abilities.' The "hierarchical theory," so he contends, "has major advantages over almost all models of human abilities." It is in keeping with the notion that the central nervous system, as Sherrington so ably demonstrated, is itself a hierarchical structure, and is thus superior to Thurstone's conception of the mind as a miscellaneous aggregate of various 'primary abilities.' Guilford attempted to meet this difficulty by an alternative classification. He proposes to subdivide recognizable abilities according to three cross-headings—'contents,' 'operations,' and 'products.' Butcher notes both the advantages and disadvantages of this somewhat elaborate scheme. First, it is essentially a classification of possible tests rather than of ascertained abilities, and is thus highly suggestive for those who wish to explore new capacities by constructing novel tests. Secondly, it seems to place all so-called 'factors' on virtually the same level, and fails to recognize the difference between 'broad' factors and 'narrow' factors, or (as Professor Butcher puts it more precisely) factors of "descending degrees of generality, forming the hierarchical tree, which is widely accepted by British psychologists." Above all, as he points out, the fixed number of factors it postulates in advance, 120 in all, is far too large for practical usage: Thurstone, we are reminded, "supposed he had adequately sampled the whole area of abilities with fewer tests than Guilford has factors!"

The statistical method of factor analysis, as Butcher rightly states, provides "a powerful technique for answering the questions thus raised," though "by no means a panacea." Accordingly, at the close of the chapter the reader is presented with three simplified correlation tables, factorized by the usual procedure (based on Pearson's method of least squares), and illustrating how Galton's assumption of *both* a common factor *and* specific factors yields the best fit to the test results actually obtained.

During the recent years, however, the main target of attack has been the second of Galton's basic assumptions, namely, that individual differences in this 'general cognitive factor' are largely due to a genetic component. "The old problem of nature *versus* nurture," we are told, "has become the burning controversy in the realm of education at the present day." It therefore calls for a close and critical examination; and Professor Butcher deals with it at some length in his chapter on 'The Influence of Heredity and Related Questions.' Here, I confess, I find his treatment less satisfactory than in the other sections of his book. No adequate discussion of current views on the influence of heredity is possible without some preliminary explanation of the Mendelian theory of multifactorial inheritance—a theory which is accepted by practically every geneticist, and on which all investigations into animal and human genetics are nowadays based. And the Mendelian theory is never even mentioned.

Most educational psychologists still suppose that the term 'heredity' denotes "the tendency of like to beget like" (the definition given in the *Oxford English Dictionary*). With intelligence tests the resemblance between sibs is usually measured by a coefficient of correlation; and this "is about +·5." Hence, it is often said, heredity at most can be responsible for only 50 per cent of the variation in this particular 'trait.' Butcher, however, influenced presumably by Holzinger's early work, supposes that among present day geneticists the accepted method is to base "percentage estimates of genetic influence" on the "difference in the extent of correlation between fraternal and identical twins." Both views are incorrect.

On the Mendelian theory, Tom Jones and Ben Jones, whether fraternal twins or ordinary sibs, each inherit half their genes from their father and half from their mother; but, since the reassortment of genes is a matter of chance, only about half of Tom's halves will also be inherited by Ben. Thus of the ' genetic influences ' inherited from their parents some will form a factor *common* to both, and the rest will form *specific* factors peculiar to each. Heredity therefore must be responsible, not only for resemblances between Tom and Ben, *but also for differences*—a point which is almost invariably overlooked by educational psychologists, but goes far to explain many of the anomalies here quoted. It follows that the appropriate method of analysis will be an adaptation of the technique of ' factor analysis ' described in the earlier chapter—the modifications being based on Fisher's ' analysis of variance ' as applied to physical characteristics like height and head size.

But in any psychological research, as Butcher points out, the problem is further complicated by the fact that the tests available are apt to be influenced by environmental conditions. " The comparisons contrast the similarity of fraternal twins with that of identical twins *within the same family* " (his italics); and here the home environment is common to both. With sibs of different ages the influences within the family may to some extent effect each child differently: Tom, the elder, may be father's favourite, and little Ben may be mother's pet. Once again, therefore, we have to distinguish between ' common environmental factors ' and those that are ' specific.' Towards the end of this chapter he refers to a recent technique for dealing with this four-fold classification in the field of personality, and advances several pertinent criticisms. But unfortunately he assumes that ' variance analysis ' is the same as ' analysis of variance,' and omits the most serious objection: namely, that the use of ' variation between family means ' for the estimation of the ' common factor ' neglects the fact that this variation also includes a fraction of the ' specific factor,' as several writers have shown. These, however, are somewhat technical points.

Butcher devotes much of his chapter to describing and criticizing ' twin studies,' particularly those comparing tests of identical twins reared together and apart. These, he says, have usually been regarded ' as crucial '; but, he contends, the data so obtained are "not typical of differences between siblings in general." The figures he cites are taken from a large table (reprinted in full) giving correlations, not only for twins, but also for other groups of children related in various ways; and he fails to note that much the same numerical results are reached, if factorial techniques are applied to the data there given for ordinary siblings reared together and apart. Identical twins merely form one rather striking item in a whole mass of evidence drawn from relatives of various degrees of kinship.

The section ends with an instructive diagram compiled by two American investigators who have collected correlations for intelligence tests from 52 studies carried out in eight different countries. The investigators themselves describe " the overall results " as " definitely consistent "; other writers have stressed " the pronounced disagreements." For such a situation there is a well-known remedy. As in factor analysis, estimates calculated by the ' method of least squares ' can be derived from the entire collection of figures; and one can then test whether or not the discrepancies are statistically significant. With the American figures the percentages obtained are as follows: (i) genetic factors (*a*) common, 37; (*b*) specific, 36; total 73; (ii) environmental factors (*a*) common, 17; (*b*) specific, 10. With the British data for the corresponding type of test (top row of Butcher's table), the percentages are 39, 38: total 77; 15, and 8—a remarkable agreement.

The differences produced by differences in genes must obviously be physical differences—presumably variations in the minute structure of the brain and nervous system, as indeed microscopic studies would seem to suggest. During recent years, our knowledge of the brain as ' the organ of intelligence ' has been greatly advanced, so Butcher reminds us, by work in two distinct fields—neurology (including developmental studies) and computer design. The former, as Sholl and other neurophysiologists have pointed out, lends strong support to the concept of a general cognitive factor and its dependence on heredity. Butcher, however, in his chapter on the subject limits his description of ' neurological findings ' to " (*a*) what can be stated in non-technical language and (*b*) what fits in with analogies with the functioning of computers " ; and his account of this ever-popular topic is unusually clear and convincing. This is followed by a detailed discussion of " the normal stages in the development of intelligence," based mainly on the work of Piaget and his associates. Piaget's four stages correspond very closely with those described nearly 40 years ago in the Report of the Board of Education's Consultative Committee on *The Primary School* ; and, as Butcher observes, his date for " the major change from concrete to formal thinking " (11 plus) " tallies with the age at which secondary schooling begins in England."

The other ' related questions ' selected for discussion—' creativity and intelligence,' ' problem solving and concept attainment,' ' social and cultural influences '—are equally topical. Two of the most useful chapters present a brief account of the principles of psychological measurement and a ' selective survey of intelligence tests.' The book ends with an inquiry into " the relative influence of ability and non-intellectual factors on achievement in school, in the university, and in after-life." Here the chief sources are Terman's studies of his ' gifted group,' followed up for over 30 years. Butcher notes that over 90 per cent of the boys in the American group and as many as 80 per cent of the girls entered college ; on the other hand, in Britain (as the studies of Nisbet and his collaborators have shown) only about 73 per cent of highly gifted boys and barely 50 per cent of the girls go on to the university. Nisbet himself points out what " a rich field of material there is for short-term research " in the records kept by local education authorities of the results of tests applied in selecting pupils for secondary education—data on which several of his own inquiries have been based. Butcher speculates about the after-careers of pre-war pupils in England. Those who are interested will find a detailed review of follow-up studies of London pupils who gained junior county scholarships in the *Yearbook of Education* for 1962 (" The gifted child ").

The omissions and other minor imperfections of which the specialist or research-worker may be tempted to complain are largely due to the aim Professor Butcher has set himself, namely, to restrict his exposition to what will be intelligible and interesting to the general student. His style is readable and refreshingly free from the jargon that disfigures so much contemporary writing in the field of education. Throughout the volume his discussion of the complex problems with which he deals is admirably eclectic and impartial, and always linked to practical issues current at the present day. It is a book that should be read by every student of psychology or education, and by every educational psychologist who wishes to bring himself up to date.

BOOK REVIEWS

ARNOLD, MAGDA B. (Ed.) (1968). *The Nature of Emotion: Selected Readings.* London: Penguin, pp. 397, 9s.

For this volume Professor Arnold has chosen those psychological studies ofthe nature of emotion that seemed to her to " offer some original theory or research or a creative integration of data rather than a mere review." It is a pity she has excluded the writings of philosophers, since some of the most valuable insights into the nature of emotion stem from the past. Nevertheless she has provided a meaty set of 27 readings. Most are from English-speaking authors (only two British—A. F. Shand and W. McDougall) but four are French and three are German.

The stress is upon emotion as experience rather than emotional behaviour. The first seven of the nine parts of the book are essentially concerned with answers to the question, " What is emotion? " Part Eight consists of Michotte's interesting paper on " The Emotional Significance of Movement " and Spitz's paper on " Emotional Development in the Infant." The final part (one-fourth of the book) is devoted to Neurophysiological Aspects of Emotion and is highly technical. Part I opens with a statement by William James of what has become known as the James-Lange Theory of Emotion. W. B. Cannon's refutation of that theory follows. In the section on " Emotion Rooted in Instinct " Shand and McDougall are cited as proponents of the correlation between the primary emotions and instincts. Nothing, however, is said about the positive contribution Shand made to our understanding of emotion with his concept of ' sentiments.' The psycho-analytic theory of emotion is very briefly considered in excerpts from David Rapaport and J. Hillman. Representative of Behaviourist viewpoints on emotion are Duffy and Hebb. Two Frenchmen, Claparède and Pradines, are quoted as protagonists of the theory of emotion as disorganised and disorganising. R. W. Leeper provides a critique of this theory. In Part Seven on " Emotions as Organised Tendencies," Professor Arnold and her colleague, J. A. Gasson, as well as R. W. Leeper and R. S. Lazarus, provide correctives to those theories which pay too much attention to the disorganising function of emotion and to the expression of emotion rather than to its organising function and the perceptual-appraisal processes which precede the expression of emotion. This section is among the most useful in the book.

Altogether, this is a valuable set of readings, even though the reader puts it down with the realisation that the psychologist has still much to discover about the nature of emotion.

A. LAING.

BANNISTER, D., and MAIR, J. (1968). *The Evaluation of Personal Constructs.* London: Academic Press, pp. 227, 50s.

In the beginning the authors give a clear outline of construct theory relying, quite rightly, on extensive quotations from the original work by Kelly. They make explicit that the fundamental postulate of this theory " that a person's processes are psychologically channelized by the ways in which he anticipates events," has not been proven true and need not even necessarily be so, but is regarded as if it were true. The remainder of the book is taken up with a description of the empirical methods developed to explore the implications of the theory and to a discussion of the findings thus obtained. It may be stated at this point that there is a most complete coverage of work in this area including references to many unpublished theses, some as recent as 1968.

After a description of the original repertory grid technique in its various forms the authors proceed to a description and discussion of more elaborate and complex types. It may surprise some readers, incidentally, to learn that the elements of grids (usually people) have varied from films and emotions to types of bread! There is an interesting discussion comparing and contrasting the semantic differential with grid techniques which concludes that they are basically different instruments, the results of differing psychological approaches. From all this a formal definition of grid method is proposed—any form of sorting task which allows for the assessment of relationships between constructs and which yields these primary data in matrix form.

In the chapter on validity the authors seem to be in difficulty, perhaps because it is unclear what the technique purports to achieve. The validity of grid techniques may be examined, they argue, by relating new constructs to old. Indeed, the validity of construct grid techniques is claimed to come from the fact that significant internal relationships exist among the constructs of most people. None of the validity studies relating grid technique to behaviour are particularly convincing, as even the authors admit, since in many cases simple enquiry could have provided the same results.

This chapter highlights one of the main disappointments of the book. Although the book is a detailed and closely argued summary of construct theory and its research techniques, it nowhere becomes clear exactly what is gained by administering a repertory grid. True, the constructs of the subject are clarified and may be subjected to statistical analysis, but then what follows? It seems that clinical skills have still ultimately to be used to interpret the data. It is a pity that the authors do not make a greater attempt to justify the immense effort that has gone into these researches. They feel that the value of the theory and the techniques is self-evident—a fact that some readers may find it hard to accept.

This is not an easy book to read. The prose style indeed, resembles that of a journal article rather than a book in that all arguments are tightly compressed and there are few concessions to elegant style or wit. Furthermore, construct theory has developed its own vocabulary as the necessary appendix makes clear, e.g., guilt—the awareness of dislodgment of the self from one's core role structures.

In summary this book is essential reading for any psychologist interested in the application of construct theory to research into either personality or clinical assessment.

PAUL KLINE.

BAUMEISTER, A. A. (1968). *Mental Retardation: Appraisal, Education, Rehabilitation*. London: University Press, Ltd., pp. viii+419, 105s.

This is a readable and stimulating book. Like many publications written by several authors it does not pretend to evaluate or describe the various procedures in mental deficiency in any great depth. The book provides an excellent survey of work carried out in the field and many of the references are not contained in other standard texts.

The individual chapters vary in standard and are written by authorities from a wide range of disciplines. Some of the ideas expressed are refreshing in their originality and clarity of expression. Unfortunately, some experts go beyond their probable range of expertise and make over-simplified statements of doubtful validity. For example, in one chapter we are told that hearing loss is not found to be significantly related to IQ. What IQ means in this context is not clarified. Such criticism could be levelled at many modern texts but it is unfortunate to see such errors in a high calibre text book of this kind.

Any further summary of this compound work could be indigestible and for this reason the reviewer will only attempt to supply a ' taste ' of the contents. Brison has written a stimulating chapter in which he contrasts the traditional ' one-disease one-cause ' classification in medicine with the more complex multiple classification of the natural sciences. He poignantly argues that the employment of the latter type of classification in mental retardation is of fundamental importance to the development of our educational strategy.

The chapter by Bialer on Psychotherapy is careful and objective. It is marked for its lack of bias towards any particular model and includes some less well-known methods of therapy with the retarded.

Some chapters assume the reader will have a reasonable groundwork in a particular subject, for example, the chapter on speech and hearing assumes some knowledge of audiometric assessment. Others, such as Cromwell's chapter on

Personality Evaluation deal with elementary procedures which provide a useful introduction for the newcomer to clinical psychology.

Beumeister's own chapter is a concise evaluation of research and practice in the field of learning which should be invaluable to those acquiring a professional training in psychology.

The chapter on vocational preparation includes a discussion of assessment and prediction which repays careful study. Wolfensberger delineates some of the weaknesses of research in this area and notes the essential lack of generality in the findings. Underlying many of these research studies is the lack of clarity in selecting criteria for prediction purposes together with a lack of appreciation of realistic goals which might be associated with a particular form of training. The chapter underlines the need for a re-appraisal in this area and a closer association between practical habilitation and research.

A further chapter by Wolfensberger, on parental counselling, together with Butterfield's contribution on institution personnel, help to make this an imaginative and wide-ranging text which can be highly recommended to those professionally concerned with the slow learner in our society. R. I. BROWN.

COHEN, J. (Ed.) (1968). *Psychology: An Outline for the Intending Student.* London: Routledge and Kegan Paul, pp. xi+203, 25s.

Routledge and Kegan Paul have struck upon the bright idea of publishing a series of *Outlines for the Intending Student*. If the volume on *Psychology* is any measure of its worth, the series deserves success.

The editor, Professor Cohen, has contributed an introductory chapter on "Psychology As a Science." The tone of this chapter is generally subdued and only occasionally is the reader permitted flashes of Professor Cohen's astonishing erudition. Thus, not even the most inattentive of his young readers should be misled into supposing that the details of embalming in Ancient Egypt (p. 9) is a burning issue in contemporary psychology. My only criticism of this chapter is its inclusion of one of those tiresome diagrams purporting to show the relation of psychology to the arts and sciences (p. 20). This presents PSYCHOLOGY (*sic*) at the centre of the universe of knowledge surrounded by its lower-case satellites, Zoology, Social Scences, Humanities, etc. In this case, the harmony of the spheres sounds distinctly like a sixth-form raspberry!

Other chapters are on "Physiological Psychology" (Neville Moray), "Experimental Psychology" (Andrew Gregory), "Developmental Psychology" (Richard Skemp), "Language and Communication" (Professor Oldfield) and "Social Behaviour" (Professor Gustav Jahoda). Two interesting things to note here are the inclusion of the chapter on "Language and Communication," a more specific topic than the others, and the omission of any treatment of "Personality."

Dr, Moray in his whirlwind tour of physiological psychology manages admirably to convey, with a minimum of technical detail, the spirit of this mode of investigation. Dr. Gregory in 25 pages achieves a masterly, coherent condensation of traditional 'experimental' topics. Dr. Skemp does likewise for 'developmental' topics and those who favour a comparative approach will find his chapter particularly congenial. Professor Jahoda, in his engaging ramble through social psychology, leads us from Northern Ghana and the social organisation of the Konkomba to the laboratories of Oxford and Paris where common aspects of social intercourse, such as eye-contact, are subjected to rigorous experimental analysis.

It is difficult to conceive of four better treatments of these topics within the span allowed to their authors and it is unfortunate, then, to have to report that Professor Oldfield's chapter on "Language and Communication" disappoints. Professor Oldfield is evidently so conscious of the dangers of being charged with Transformational Zealotry that he makes only passing reference to contemporary American research in psycholinguistics. Most of the time he remains on safe English (more precisely, Oxonion) soil. Such parochialism is oddly at variance with the vigorous, cosmopolitan character of today's research into the problems of language and communication.

Stylistically, the book is admirable. Each of the contributions is written in an articulate, unpretentious style and, in general, the empirical studies described have been carefully selected to arouse and maintain the reader's interest. An enterprising feature of the book is the inclusion of an appendix presenting information on courses in psychology offered by British universities. This is a splendid idea but, in the nature of things, the reliability of such information is in inverse proportion to its detail. To my knowledge some of the information presented in the appendix is already obsolete.

This is a book which can be enthusiastically recommended not only to aspiring students but also to wives, parents, and all who confess to bewilderment about the nature of our subject. BRYAN BETT.

COLLIER, K. G. (1968). *New Dimensions in Higher Education.* London: Longmans, pp. 164, 18s.

In his Preface Mr. Collier explains that the ' new dimensions ' in higher education are the great increase in scale and the advent of educational technology. In another sense, however, one might say that these are rather the occasions for reappraisal and that his real new dimensions—that is, directions of progress—are active methods, moral values and human relations. These are new in that in the past higher education, taking place in institutions with a relatively small and manageable student body, was perhaps able to go on in its traditional academic way without too much conscious attention to such things. Mr. Collier is well known as an advocate of reform in the three areas mentioned and in this book a number of his published articles have been brought together under one title. The book lacks literary unity, its component articles being somewhat heterogeneous in character, but that is a minor flaw when one considers the solid meat which most of these articles contain.

In the field of methods Mr. Collier gives useful examples of active modes of study. Particularly convincing is his exposition of syndicate methods. In the sphere of moral values he wants to subject the moral aspects of human actions to the full light of academic discussion. Thus in literature, history and the social sciences the tutor " should give as much attention to questions about justification as to those about motivation of actions." Mr. Collier's favourite technique for this is the discussion of films, and it is clear that his favourite film for this purpose is " Twelve Angry Men." In the chapter on staff-student relations Mr. Collier examines colleges and universities in the light of Etzioni's work on the sociology of institutions and shows present-day phenomena in new and revealing perspectives.

All in all, a thoughtful and helpful book. STANLEY NISBET.

CRATTY, BRYANT J. (1968). *Psychology and Physical Activity.* New Jersey: Prentice-Hall, Inc., pp. x+214, 55s. 6d.

The author's own description of the book, " Guidelines from the behavioral scientist for physical education teachers and athletic coaches," indicates the population for whom it is primarily intended, i.e., those physical education specialists, of a more theoretical inclination, who accept that in order to understand movement it is necessary to be concerned not only with its mechanical aspects—anatomy, physiology, kinesiology—but also with its psychological aspects—motivation, learning, perception. It is, however, probably worth reviewing in this journal for two reasons. First, it would be of value to lecturers in educational psychology in colleges of physical education who are anxious to develop a psychology course of good face validity to students whose major interest is movement and physical abilities in general. And secondly, for psychology lecturers in general colleges of education, the book could provide new illustrations for what is often a somewhat dehumanised aspect of the course in child development—physical development and the acquisition of motor skills. For these three groups, then, the book would seem to have much to offer.

The book is divided into seven major sections: response characteristics of the performer, maturation, motivation, perception, learning, group interaction, and the superior and the inferior performer. Each section typically contains two or three chapters, some of not more than six pages, complete with a summary and a well detailed bibliography. The treatment is quick and slick rather than scholarly exhaustive. The bibliography is a commendable feature of the book. References are varied, ranging from historical milestones of the 1930's to research of the mid-1960's. They are drawn from the psychological classics, from journals of general psychology and child development and psychiatry, as well as those of a more recondite nature, " Sexology " to name one. Attention is paid to research at both animal and human level.

Overall, not an attractive or easy book to read in its entirety, being tiresomely fragmented into numbered paragraphs and corollaries and even subcorollaries The price, 55s. 6d., seems in excess of the solid content of the book.

Bryant Cratty is Director of the Perceptual—Motor Learning Laboratory, University of California. The book is his third. LORNA M. SIMPSON.

EVANS, K. M. (1968). *Planning Small Scale Research.* London: National Foundation for Educational Research, pp. 87, 6s. 6d.

Academics who argue in favour of research as a valuable element in teacher education—whether initial or advanced—will be heartened by Dr. Evans' claims that such exercises improve skill, give greater insight, provide training in guided observation, encourage the testing of hypotheses, and contribute to the education of the student. There is a high-minded ring about the personal qualities enumerated as appropriate in a research worker—determination, patience, a sense of proportion, courtesy, honesty and respect for other people's time—but whether one may legitimately regard these as educational objectives, fostered by involvement in research, or see them simply and sadly as prerequisites, is another matter.

Such fundamental questions, however, are not discussed in Dr. Evans' book; its aim is to provide simple practical guidance for beginners in research of an experimental or survey type; historical, critical and philosophical studies are explicitly excluded. It is a book for the teacher embarking on an advanced course or wishing to tackle some research project on his own, for students in colleges or schools of education, and for their tutors, who must often have given the sound advice provided so compactly in these 90 pages. The advice is realistic—on the indispensability of statistical literacy, on the right of schools to insist, despite research demands, on getting on with the job of educating children. The warnings are wise—against irresponsible use of trivial questionnaires, against slovenly references, against chaos in distributing test material (but can this last wisdom be acquired by prior warning, or merely retrospectively recognised as such after learning from experience ?). Not only advice on procedures is provided: there are well-chosen sets of ' starter ' references—only three or four for each topic—a blessing to students beset by booklists of 160 titles each—and brief but useful guidance on sources and services useful to research workers (with a pardonable bias in favour of the services provided, and the tests and journals published, by the NFER). The advice on writing a thesis or (inevitably in less specific terms) an article, is excellent (though the disapproval of profuse footnotes would condemn many a distinguished author). " The coining of new terms should be avoided " says Dr. Evans sternly; a reader must not be compelled " to disinter an author's meaning from a welter of ill-constructed sentences "—and she keeps her own good counsel. These are 90 pages of sound advice written in admirably clear English, well indexed, beautifully produced and bound—but " who is to tell " asks the author, referring to tabulation of data, " whether J. Smith is John or Jane ? " Who indeed ? This reviewer has already heard reference made to K. M. Evans, his book." WILLIAM CURR.

FELLOWS, B. J. (1968). *The Discrimination Process and Development.* Oxford: Pergamon, pp. 218, 75s.

The author of this volume, the fifth in the International Series of Monographs in Experimental Psychology, sees it as an attempt to bridge the gap between traditional behaviour theory and developmental psychology. The specific aims are to present a model of the operations involved in the process of discrimination and then to investigate the developmental features of these operations, notably the perceptual and motor aspects of performance. He is concerned to delineate the skills required at each stage of the discriminative process (notably in the matching-to-sample task) the points at which breakdown may occur, leading to failure, and the problem of how far such skills may be improved by training or instruction.

Before presenting his own model of the discriminative process, he devotes twelve chapters to an examination of theories of discrimination learning, with particular reference to the role of orienting and attentional processes and the functions of the stimulus processing unit. He is concerned, too, with error reduction through training and the use of verbal responses. His survey of the experimental and theoretical work of investigators such as Spence, Wyckoff, Zeaman and House, Kendler, Sutherland and Mackintosh, Lawrence and others will be of particular interest to undergraduate students in psychology. For those who are not themselves specialists in this particular field, the treatment is not easy reading, and the amount of specialised jargon does seem to complicate what should not in itself be too difficult to understand. However, this is a criticism which is not to be taken as directed too literally against the author himself. His own model, necessarily, suffers from the same fault, if fault it be.

Dr. Fellows himself carried out experiments upon the ability to discriminate differently oriented forms, using young children as his subjects. He makes the link between perception of orientation and success or failure in the early stages of learning to read. His summary of research on problems of reversals and of laterality will be of relevance to psychologists interested in the field of perception and may stimulate educationists concerned with reading progress. He draws attention to research findings which indicate that orientation perception in children is a skill sensitive to training. This section of the book will appeal to those who may not feel drawn to the more involved argument and presentation which precedes it.

Finally, there is an up-to-date set of references which should commend themselves to those who have to teach students about the discrimination process. The book, however, seems a rather costly buy at 75s. GERTRUDE KEIR.

GATHERCOLE, C. E. (1968). *Assessment in Clinical Psychology.* London: Penguin Books, pp. 174, 6s.

SAVAGE, R. D. (1968). *Psychometric Assessment of the Individual Child.* London: Penguin Books, pp. 117, 6s.

Gathercole's very readable book surveys a variety of current assessment practices in Clinical Psychology. He discusses the process of referral, the relationship between psychologist and psychiatrist, types of assessment and the factors which lead to the choice of particular tests. A feature of the book is the extended discussion of the Meehl-Rosen argument about base rates in diagnosis and the validity of tests. Otherwise psychometric theory is suppressed in favour of presenting the context in which clinical assessments are made, with diagnosis and treatment not too far away. It is assumed that the reader knows something about tests, but a selection is described briefly in one appendix and tests in common use are listed in another. Gathercole sketches a broad role for the clinical assessor between that of mere test technician and all-knowing experimentalist. Some might feel that he has strayed too far from his test manuals; others that he has undersold his profession. All in all, this is an eclectic account which should help both undergraduates and beginning postgraduate students to appreciate the scope of the assessment problem.

Savage's much shorter book has a very different style. More than half the book is an annotated listing of tests for the assessment of intelligence, attainment, personality, and the perceptuo-motor skills. A good range of tests is discussed but the level of psychometric argument is poor. Tests are often evaluated by fiat (e.g. " efficient and sound " (p. 47)) and very personally at that (e.g. " I feel it is, and will be, of immense value " (p. 65)). It is unfortunate that the reader is led to believe that a test's usefulness may be gauged without reference to the many contexts in which decisions are made. There is a false probability argument on p. 37 and several citations are not referenced.

A section on case studies accounts for about 20 per cent of the book and here Savage is clearly more comfortable. A further 10 per cent of the book is a statistical appendix which should not have been written. Three formulae are incorrect, two calculations are ill-rounded, and symbols are left undefined in four equations. Worse, the explanations are misleading or meaningless or just plain wrong. More generally, the longer sentences, particularly those in introductory sections, often contain half-expressed ideas, loose statement or gratuitous information. This is not a happy book. The structure is promising but the execution leaves much to be desired.

PHILIP LEVY.

GIBSON, J. J. (1968). *The Senses Considered as Perceptual Systems.* London: Allen and Unwin, pp. xv+335, 40s.

It is refreshing to read a book on the psychology of perception which not only ignores psychophysics but considers it irrelevant to the study of perception. Even those, like this reviewer, who are interested in these irrelevant fields of study will be stimulated into thinking carefully before venturing any disagreement.

With his earlier book, *The Perception of the Visual World* (1950), Professor Gibson has already acquired a reputation for detailing the complexities of stimuli in the real world (as opposed to the simple stimuli of the psychological laboratory), and emphasizing their importance in perception. In *The Senses Considered as Perceptual Systems* he extends this approach to all the senses, and introduces several other important concepts. Perhaps the most important of these is the idea of the senses as active systems seeking information about the environment, rather than as passive receivers of stimulation. For example the auditory system consists not only of the two ears but also includes the muscles which move the head so as to orient the ears to a source of sound. The perception of sound thus involves an active listening by this complete system rather than a passive hearing by the ear.

The significance of this approach is stressed by Gibson's other main concept, that an observer perceives the constant properties of objects even though the variables of stimulus energy and the resultant sensations are continually changing. The constant shapes and textures of objects are perceived by touching and feeling, in spite of the irregular temporal and spatial pattern of pressure stimulation.

If one considers the complete haptic system to include the muscles which move the hand and fingers, then it is the relations between the stimulus pattern and the control signals to the muscles which enable the brain to determine the invariant properties of external objects. The simpler relation between stimulus energy and sensation, which has been widely studied by psychologists, is considered as incidental to this active process of perception, in opposition to the more conventional view that perception results from organization of the fundamental sensations.

The complexities of visual perception are naturally very well described, with many excellent and clear illustrations. The many ways in which light is structured by the environment are systematically described by a set of principles which Gibson has named '.ecological optics.' At times this description seems to border on a statement of the obvious, but this is only a reflection of the general tendency towards clarity in the whole book.

The general approach is clearly relevant to problems such as the learning of letter shapes by children, where active hand and eye movements tracing the shape seem very important for learning. More examples of this kind would have been welcome, but this is of course just the kind of research which this book is likely to stimulate.

ANDREW GREGORY.

GOODACRE, E. J. (1968). *Teachers and their Pupils' Home Background*. London: National Foundation for Educational Research, pp. xiv+170, 25s.

This is the report of the second stage of a detailed and thorough investigation, the first stage of which was reported by Dr. Goodacre in *Reading in Infant Classes* (1967). This second report is a detailed study of infant teachers' attitudes and backgrounds—personal and professional—and their relation to the teachers' expectations of the progress of their pupils in reading.

Head teachers and teachers completed three extensive questionnaires concerned with the size and organisation of the school, the methods and reading schemes used, the amount and nature of parental interest, the teachers' information about the home background of the children and a fourth questionnaire about the teacher's own status, education, attitudes and background. They also furnished estimates of reading readiness and level of attainment which were compared with scores on the NFER Reading Test (Form NS45).

The data were analysed in relation to four main variables (*a*) social class composition of the school, (*b*) organisation of the school (size, infant only, infant-junior), (*c*) status of teacher (head or class), (*d*) teacher's social origin (middle or working-class). Conclusions, all significant at or above the 5 per cent level, are presented and many points are elaborated. Teachers consider home background important and tend to define the ' good ' home as one that facilitates the teacher's task and they differentiate between upper and lower working-class homes mainly on the basis of motivational and cultural items. The older or more authoritarian type of teacher with unfavourable attitudes to pupils and their homes is most likely to categorise pupils in terms of ' good ' or ' bad ' homes. Teachers working in lower-class areas tend to categorise by stereotyping occupations because many have inadequate knowledge of the present gradients of status in the manual working-class. The inferences teachers make from their categorisations affect their ratings of individual children but school organisation appears to have greater influence. It is suspected however that the personality of the head teacher and his or her attitude to the pupils' background has an indirect but important effect. The social class origin of the teachers appeared to have much less effect on their expectations of their pupils' progress than either the organisation or the present status of the school. The report also has an interesting discussion of the image of the infant teacher.

This is a stimulating and valuable survey not only for its well-designed attack on the relatively unexplored area of the sociology of teachers, but for the wide range of new research problems which it suggests. A. H .STEWART.

KAYE, B., and ROGERS, I. (1968). *Group Work in Secondary Schools*. Oxford: University Press, pp. 146, 15s. cloth, 8s. 6d. paper.

" Group work," the authors declare, " has its problems " and set out to " make some suggestions as to how best to organise group work so as to anticipate these problems."

The book is not well constructed and the style is, for the most part, colloquial, repetitious and, at times, awkward. The reader's attention is constantly caught with side references ; Truby King is, for example, " probably responsible for more misery in the world than almost any other " and John Holt's *How Children Fail* (Pitman, 1964) is " one of the most fundamentally provocative books on education to be published this century."

The authors announce that they do not belong to the company of those who " force fanciful methods based on high-falutin theories on credulous students." If dogmatism there be it is to be excused on grounds of enthusiasm rather than expertise and they repeatedly stress that the group work they describe is to be regarded as one part only of the range of techniques available to the secondary school teacher.

Group work is defined (Chapter 2) as " a method of teaching in which activities or tasks are carried out by small groups of pupils, such groups being self-selected and self-directed." It is distinguished, by the authors, from group teaching the characteristics of which are said to be teacher-direction in terms of both assignments and group membership. The point is made by drawing what some might regard as a caricature of the procedures used in classes using group teaching; the authors see this as " no more than the logical extension of the system of academic streaming." As part of the argument at this point the following footnote is offered:

" Though it should be pointed out that two of the basic assumptions of such streaming, whether within the class or within the school as a whole—that the academic aptitudes of children are (i) innate, and (ii) able to be measured accurately—would no longer be accepted without question by the majority of educational psychologists today."

There has been too much misunderstanding already on this point and authors should accept a self-denying ordinance designed to ensure that the matter is raised only when adequate discussion can be given preceded by a careful definition of terms.

The title of the book indicates that particular attention is paid to training teachers in the use of group work and the book is developed from the description in Chapter 2 of a 'large-scale experiment' which involved placing 100 college of education students in secondary schools for a morning a week for two terms. Later in the book (Chapter 7) the authors give further information on problems associated with providing this kind of classroom experience for student teachers. Some typical group investigations are referred to in Chapter 5 and further practical and useful advice on matters of organisation is given in Chapter 4. Chapter 6 on the rationale of group work has a useful summary of research findings on the social psychology of groups.

The theme is an important one and one to which writers on methods will return as more schools move away from the idea of the class and the class lesson towards learning groups of varying size. This volume will provoke the well-informed but could mislead the less expert. There is a useful bibliography to which Part II of the National Society for the Study of Education's 59th Yearbook *The Dynamics of Instructional Groups* (University of Chicago Press, 1960) should be added.

ALEC ROSS.

LAWTON, D. (1968). *Social Class, Language and Education*. London: Routledge, Kegan and Paul, pp. ix+181, 25s.

The continuing interest in all aspects of the theme of social class in relation to education will be further stimulated by this study. It is essentially a report of some experiments arising from Bernstein's socio-linguistic theory, but it includes also a wide-ranging survey of work in the same field.

After summarizing the evidence of social class disparities in educational opportunities and school performance, sub-culture differences in motivation and attitudes to education are discussed and a brief historical sketch is given of researches dealing with the relationship of language to social class and environment. There is a long chapter on language and thought in which a number of psychological and anthropological theories and studies are examined. A critique of Bernstein's work, which serves as a conceptual framework for the report of the author's own studies, brings some much needed clarification to the complexities of an emerging theory, though it would be a mistake to regard it as a substitute for the original articles.

The experiments which it is presumably the main purpose of the book to report are given relatively little space and readers wanting more details will derive scant satisfaction from the assurance that these are contained in the journals. The research replicates Bernstein's study of discussion groups with more or less identical results and extends it to written language and to the more demanding type of situation in which the investigator interviewed subjects individually. Social class differences again emerged but the interview results suggested that the character of the situation may play some part in determining indices of linguistic codes. This was a study in depth rather than breadth and a considerable volume of spoken and written material was produced by each subject; inevitably therefore, the number of subjects was severely limited and one wonders to what extent the samples truly represented the social classes from which they were drawn. Details of the statistical tests are not given and the reader can only speculate on the degree of confidence that can be placed on results based on samples too small to be compensated for by the volume of data collected. It should be noted however, that the author admirably refrains from precipitate generalizations.

He concludes the book with a useful account of some of the enrichment programmes that have been planned in the United States and Britain and discusses some implications of the work reviewed for education.

The book is a timely reminder that the problem of unused potential is still intractably with us and underlines the complexity of the task of meaningfully identifying linguistic deficiencies. Dr. Lawton has at least made the issues clear. He has contributed significantly to the methodology in this field and has added suggestive evidences to its growing body of knowledge. It is a book to be recommended to those concerned with the education of teachers and to research workers.

T. E. WYNNE.

LYTTON, H. (1968). *School Counselling and Counsellor Education in the United States.* London: National Foundation for Educational Research, pp. 78, 12s. 6d.

This report is based on impressions gained in the course of a three months' tour of the U.S.A. The author visited many colleges, concentrating chiefly on those which enjoy the highest reputation for work in counsellor education. He also visited 13 schools in different parts of the U.S.A., talking to counsellors, to teachers and to administrators, and also sitting in on counselling interviews and discussing the work of the counsellor with the pupils themselves. Such first-hand impressions are supplemented by study of American books on counselling, by data from official documents, and by survey data.

This monograph is unquestionably an eye-opener. It highlights the enormous gap that exists between theory and practice. Whereas the training of counsellors emphasises the role of the counsellor as a sort of non-directive mid-wife to the emerging personality of the normal pupil, in practice the vast majority of counsellors in high schools devote nearly all their time to highly directive and more or less perfunctory advice on course options in the context of the American 'cafeteria' curriculum, together with advice on appropriate choice of further educational institutions.

However, Mr. Lytton also emphasises therapid expansion of counselling services in elementary schools and in junior high schools, where the pastoral side of the work achieves far greater prominence. Not the least interesting of this findings are those which concern the attitudes of teachers and pupils to counselling. Contrary to what may be supposed the vast majority of American counsellors are experienced teachers, just as they are in Britain, and nearly all those connected with the service are keen that this should continue to be so, the outstanding exceptions being the trainers of counsellors.

Mr. Lytton's report is extremely well organised. It is admirably clear and concise, and it is both penetrating and sympathetic. It includes a useful chapter on implications for counselling in Britain. In the opinion of this reviewer it is a 'must' for anyone interested in counselling, and I share the author's implied belief that the number of such interested parties is growing and ought to grow more.

E. A. LUNZER.

MCLEISH, J. (1968). *The Lecture Method.* Cambridge: Institute of Education, pp. 60, 8s.

This is the first of a timely new series of Cambridge Monographs on Teaching Methods, and has three main sections. The first describes experiments, mainly by the author, concerning immediate and delayed recall of lecture material, the second deals with students' attitudes to teaching methods, and the third provides a review of the literature on the lecture method. In his conclusions, the author acknowledges the specific virtues of the lecture as a teaching method, but stresses that this in no way justifies the lecture system, where little or no attention is given to other methods, such as tutorials, seminars, etc.

After discussing Trenaman's experiments on the recall of broadcast talks, McLeish describes his own research on the recall of lecture material. Some of his initial results are based on as few as four students, and later experiments, using larger numbers, failed to confirm all the original findings. Marked individual differences were found, and the attitudes of the students to the research obviously affected the results. Motivation to learn emerges as a more important factor than the method used to teach, and it is obvious from the survey of students' attitudes to teaching methods that this is a very individual problem.

When he related students' attitudes to their scores on personality tests, McLeish found some very interesting groupings. Such group differences can, of course, only be tentative until replicated by other workers, but they do provide a rich source of hypotheses for further research.

In view of the recent suggestion that students should assess the teaching ability of their lecturers, it would be most helpful if McLeish's two approaches could be combined to find out whether students' attitudes correspond with the amount they learn. If one enjoys a lecture, for instance, can one necessarily recall more of its content later than that of a lecture which seemed rather dull?

McLeish's book should be read by everybody interested in university teaching methods, and will be found to provide a most useful foundation for subsequent research.

G. W. H. LEYTHAM.

MISCHEL, W. (1968). *Personality and Assessment.* New York: London and Sydney: John Wiley and Sons, pp. xii+365.

It is clear that Professor Mischel has wide knowledge of experimental human psychology and has devoted a great deal of time to thinking and reading in his chosen field and on related topics. The result is a book containing much that is interesting and sensible but this reviewer found it not very readable. Shortening it to about two thirds of its length would help, but what the book most needs is rewriting into clearer English and a considerable reduction in the number of technical terms. These are ruthlessly overworked.

The following passage is quoted as it gives some idea of the subject-matter, the style and the frequency of use of the word 'referent.' "For example, the assessor might ask, 'How do you know when you are anxious?' The purpose of these probes is to obtain public referents for subjective experience, and not to validate the truth or falseness of the client's phenomenology. The issue here is not whether the person is 'really' anxious, but rather the discovery of referents for his perceptions regardless of their accuracy. After the client has tentatively formulated some response referents for his subjective problem, the assessor tries to discover the exact conditions under which the referent behaviors change."

As this characteristic passage indicates, the perspective of the book is behaviouristic. In the earlier chapters Mischel points out, with a wealth of illustration, that the traditional methods of assessing personality are unsatisfactory in that their so-called 'validatory' measures are almost always between tests, as opposed to real life situations—in particular, as opposed to behavioural criteria. He stresses the lack of empirical evidence both for validity and for reliability. "These arguments for basic consistencies that underlie surface diversity are theoretically defensible, but they ultimately depend, of course, on supporting empirical evidence." He is strongly, and convincingly, against "trait ratings and personality questionnaires," since conclusions based on these techniques depend largely on the subjective meanings of the words used and "often reflect raters' constructs rather than underlying traits."

Mischel wishes to replace trait theory and personality theory by behaviour theory. In his view what we need for assessing—and what we, to some extent, already have—is techniques of *behaviour assessment*; and what we need in the field of therapy, is techniques of *behaviour change*. The book contains some interesting case histories and some challenging ideas but, in the reviewer's opinion, it is marred by its one-sidedness and by its turgid style. A. W. HEIM.

O'NEIL, W. M. (1968). *The Beginnings of Modern Psychology*. London: Penguin, pp. 157, 6s.

Professor O'Neil's introductory monograph in the "Method and History" section of the *Penguin Science of Behaviour* series is written as a backdrop to forthcoming studies of contemporary movements in psychology. It is a briefer, and at the same time, rather more theoretically orientated, Flugel. After two short chapters on the long philosophical past (covering in a dozen pages the period from Descartes to the 19th century associationists, with a passing glance at Aristotle), and the immediate physiological present (18th and 19th century physiology and neurology), it deals in the remaining 100 pages with the period 1879 to 1925. Professor O'Neil is a scholarly writer, at times, indeed, almost too scholarly. His references may sometimes baffle even the most learned, and certainly stun the novice. Who were Tischer, Merkel and Kämpfe? Is it important that a 150 page book should mention Okabe and Pyle? The select bibliography is too select to inform us where we can find the contributions (possibly weighty) of these gentlemen. Or were any of them ladies?

Any brief account of the rise of modern psychology must almost certainly be controversial. What is to be included, what left out? Where is the emphasis to lie? Professor O'Neil's standpoint can perhaps best be described as orthodox Boring. It is centred on the act-content, function-structure dichotomies of German thought. I should have preferred a more biologically orientated account, giving more weight to Darwin and Pavlov, to comparative, developmental, abnormal and later social psychology. But this, of course, is a matter of opinion.

Quite clearly the critical question which has to be asked by the authors of this series of monographs is the question for whom the books are being written. I am not sure that Professor O'Neil has answered this question with sufficient clarity. His monograph is tantalizingly brief for the advanced student, but excessively difficult in places for the beginner. It is an exceedingly good six shillings' worth, but to understand what Professor O'Neil has written, it would be necessary to borrow or buy quite a few more expensive tomes. L. S. HEARNSHAW.

QUAY, HERBERT C. (Ed.) (1968). *Children's Behaviour Disorders: Selected Readings*. U.S.A.: D. Van Nostrand and Co., pp. 186, $1·95.

In this short book of readings the editor has set out to provide an introduction to the nature of children's behaviour disorders and associated problems of research in the field. Organized originally for a graduate seminar on the topic, the articles, of necessity interdisciplinary in nature, are drawn from psychology, sociology, criminology, psychiatry, psychopharmacology and education. The editor has also therefore provided a logical framework for the readings, leading from the epidemiology of behaviour disorders and their description and classification, to etiology and treatment, with a final follow-up study showing the relationship of childhood problems to adult psychiatric status. Most of the articles are empirical studies and seldom pure theory, while the overall tone of the sections including and following 'etiology' emphasizes the importance of reinforcement and other learning theory principles in the field of children's behaviour disorders. In the main there is a refreshing absence of psychoanalytic explanations of causality or descriptions of its therapeutic method.

Nevertheless, despite the appearance of an organized framework to this book, the articles tend to skip at times somewhat unrelatedly from topic to topic. Although many supply a desirable depth of material, it is probably inevitable that attempting to cover such a wide field in a mere 11 readings should leave an overall impression of superficiality. The editor claims in the foreword that old assumptions are often challenged and initial corrections made to various problems, yet several articles seem to cover well-known subjects without adding much that is new. On the other hand, a few make very rewarding reading, for example " Lower class culture as a generating milieu of gang delinquency " and " Mothers as behaviour therapists for their own children."

This is not a book to be recommended to students in an initial course in psychology despite its being termed an " introduction to the nature of children's behaviour disorders." It is merely introductory by virtue of its being so selective in subject matter. However, taken as a book deliberately dealing only with a few specific topics in its field it will certainly provide up-to-date useful information and perhaps suggest interesting lines of research to a more advanced student working in the area of child, clinical or abnormal psychology. JOAN MCQUOID.

ROSENBERG, S., and KOPLIN, J. H. (Eds.) (1968). *Developments in Applied Psycholinguistics Research.* London: Collier-Macmillan, pp. vii+311, 84s.

The growth of the literature on psycholinguistics continues unabated. Here is yet another collection of articles based on presented papers and bearing for the most part the stamp of uncompromising technicality. This time the source is a Summer institute sponsored by the Psychology Department of the George Peabody College for Teachers. Educationalists, and others, who wish to keep abreast of current research in this field must feel a pang of regret that the language they have to read to understand about language has to be so tough. Fortunately the effort is usually well repaid, and particularly so in the present case, because this successor to Rosenberg's *Directions in Psycholinguistics* is concerned with studies which have an unusually direct bearing on the problems which are encountered in the class and in the clinic. Between the Introduction (Koplin) and the Overview (Rosenberg) come chapters on Children's Development of Syntactic Control, Research on Second-Language Learning, Language Learning and Performance in the Deaf, Studies on the Grammar of Aphasics, Schizophrenic Language, and the Language Development of Retarded Children. Not only is the selection of topics likely to appeal to a wide range of applied interests, but the articles themselves have something special to offer in the form of a supplement to more widely available data and analysis. Thus W. J. Griffin's chapter on syntactical development gives particular consideration to studies of the syntax of older children; R. L. Blanton includes in his article an interesting analysis of the results arising from investigations of the word associations made by the deaf; and Cromwell and Dokecki offer a disattention interpretation of some of the peculiarities of schizophrenic language.

The non-clinical sections of the book provide an intriguing contrast in the use made of theories of language acquisition. H. L. Lane's chapter on Second-Language Learning is wholly Skinnerian in character, and J. E. Spradlin's article on the Language Development of Retarded Children also adopts a learning-theory approach. On the other hand, the current theory of language acquisition which we owe to Chomsky, McNeill, *et al.*, and in which imitative learning is so largely eschewed, forms the basis of Griffin's contribution and receives sympathetic reference in Blanton's chapter. As usual, it raises a crop of questions. For example, Griffin (p. 27) points again to the impossibility of explaining via imitation from adult speech the origin of some of the expressions used by the children that Brown and Bellugi (1964) observed, and speaks of such findings as indisputable evidence for the " induction of the latent structure " of language. But just because children produce structures that could not, apparently, be imitated from adults is no argument against the possibility that other structures *are* imitated. We make this demand of the explanation for no other skill. If a young child falls off its bicycle, we do not argue that bicycle riding must be innate because the child is doing something that could not have been imitated from the adult. Again, Ervin's conclusions (p. 33) that " imitations under the optimal conditions, those of immediate recall, are not grammatically progressive " leave out of consideration the possibility that imitations may only be grammatically progressive when the child is conscious of, and responsive to, some corrective or tuitional intention behind the utterance imitated, a circumstance which did not arise in her study. A final illustration of the caution needed in this line of argument is provided by Blanton's application of the idea of innate language competence to the failure of the deaf to acquire generative language through reading. His ingenious suggestion, that this failure could be due not to the absence of a generative language system, but to the failure of the educational process to co-ordinate printed English with the generative system the child already possesses, ignores the point that, according to the theory, the normal hearing child is fundamentally in no better position. Neither deaf nor hearing child is exposed to the deep structure of language. D. J. BRUCE.

RYCROFT, C. (1968). *Anxiety and Neurosis*. London : Allen Lane, The Penguin Press, pp. xii+160, 30s.

Dr. Rycroft has applied psycho-analytic and biological ideas to the interrelated problems of anxiety and neurosis. The result is a very readable and thought-provoking book, and one that raises the important and fundamental question that is invariably produced by this sort of book. How does one evaluate the ideas—stimulating and often plausible—when they are based upon psychoanalytic assumptions, clinical observations, metaphor and analogies with findings from biological disciplines? The story told here makes sense of anxiety and neurosis, but how does it coincide with the facts? Should one apply the usual scientific criteria to the assessment of these ideas?

The author is concerned " to show that neurotic behaviour can be understood imaginatively as being the result of conflicts that to a greater or lesser extent are present in us all; and to maintain the unity of science by demonstrating the extent to which human psychopathology can be shown to exemplify well-known biological principles." The words " understood imaginatively " perhaps give a clue to Dr. Rycroft's attitude to the status of his hypotheses. Elsewhere,* he has discussed the idea that psychoanalysis is not a causal theory but a semantic one. Neurotic symptoms are seen as meaningful disguised communications and Rycroft believes that what Freud did was not to explain a patient's neurosis causally, but to understand it and give it meaning. " The procedure he engaged in was not the scientific one of elucidating causes but the semantic one of making sense of it . . . On their side the analysts are claiming that analysis is what it is not, and, on his, Eysenck is attacking it for failing to be what it has no need to claim."*

The evaluation of the ideas in this book will therefore depend to a great extent on whether or not the reader believes that neuroses are diseases with causes.

One of Dr. Rycroft's aims is to dispel the notion, which he still feels is widespread, that all anxiety is irrational, abnormal and neurotic, and to show that in fact the capacity to be anxious is a biological function necessary for survival. He gives an account of the relationship between anxiety and the phenomenon known as vigilance. He states that the value of anxiety (in its positive role) is to mobilise energy to overcome obstacles, to alert the organism to unexpected and unexplained changes in the environment. If the newly perceived situation or object turns out to be dangerous or threatening there are three basic types of self-protective response available: attack, flight and submission. The author suggests that psychological defences are analogous to these three forms of biological response, which they resemble in being preceded by anxiety and in being designed to preserve the individual's integrity. They differ, however, from them in that they are designed more to preserve his psychological integrity than to ensure his physical survival. Rycroft believes that human beings, instead of attacking or fleeing from situations or persons who threaten their psychological integrity, may submit to the overpowering agency and then internalize it. Thereafter, the responses of attack, flight and submission relate not to actual environmental figures but to their internal mental representations, and the individual is engaged in purely psychological conflict with his environment. Human psychological defences are more complex than the responses of animals to danger and they operate more at the level of symbolic thought than of physical reaction. The author goes on to develop the idea that the four defensive techniques described by Fairbairn—the obsessional, phobic, schizoid and hysterical defences—are psychological elaborations of the biological reactions: attack, flight and submission. To give two examples, which cannot hope to do justice to the author's thesis: phobic reactions represent the defensive response of taking flight from the anxiety-provoking situation; the schizoid like the phobic person finds the world full of threats but unlike the phobic individual he cannot easily escape to safety by retreat because his fears of the external world remain unallayed, so he is forced to deny reality and retreat into fantasy.

Dr. Rycroft describes the different forms of neuroses which he considers to be disturbances in the capacity to master anxiety, the different types being understood as the effects of defensive manoeuvres analogous to those used by animals in objectively dangerous situations. A discussion of the treatment of the neuroses concludes a book which provides a valuable addition to our understanding of these crucial problems of psychopathology. MARTIN HERBERT.

* *Psychoanalysis Observed.* Edited by C. Rycroft.

SHUTER, R. (1968). *The Psychology of Musical Ability.* London: Methuen, pp. 347, 63s.

The publication of this book is an event of considerable importance for students of the psychology of music. The perception of sound and the basic aspects of musical experience were amongst the first areas of psychology to be studied in the psychological laboratory. Indeed, scientific psychology owes its origins rather more to Helmholtz's studies of 'tone-sensations' than to the 'psychophysics' of Fechner or to the 'introspectionists' of Leipzig and Würzburg.

Following the major contributions of Burt, Valentine, Wing, Vernon and others, the subject has languished in this country. This text is a welcome sign of the revival of interest in recent years under the benign influence of Arnold Bentley. Philip Vernon is correct in saying in his prefatory remarks that there has been no book on this subject since Seashore's survey of 1919 if he means that there is nothing in print to match the thoroughness with which the published (and unpublished) literature has been searched and judiciously appraised by this author. Dr. Shuter is herself a cultured musician: she has also carried out a distinguished piece of research on the inheritance of musical ability. The two strands of scientific method and aesthetic taste are interwoven in this text to provide a splendid repast in which even the most technical aspects of testing and the development of talent from early childhood to adulthood are presented with charm and taste. All aspects of musical ability are covered but special attention is devoted to psychological tests of musical talent and to the stages through which it develops. Virtually all existing tests (including unpublished tests in doctoral and other theses) are surveyed and two useful appendices collate the available results of factorial studies and the relationship between intelligence tests and musical ability. The book will be specially useful for research workers in this area, to teachers and performers—indeed, it has something for everyone with a serious interest in music. JOHN MCLEISH.

SNYDER, H. I. (1968). *Contemporary Educational Psychology: Some Models Applied to the School Setting.* New York: John Wiley and Sons, Inc., pp. xii+236, 84s.

The sub-title "some models applied to the school setting" is important. This is not just another text-book of educational psychology attempting, more or less unsuccessfully, to bridge the gulf between the practice of school teaching and learning and the theories of psychology. It goes outside the general areas of psychology and pedagogy and attempts to demonstrate the relevance of certain models to the understanding and, hopefully, the improvement of school learning.

It is in two parts. Firstly, " mathematical models of learning applied to school settings " ; the models described are those for predicting changes in behaviour—in particular, those models which are stochastic rather than deterministic. Estes' stimulus sampling theory forms the basis for many of the models discussed in this section. For the mathematically ignorant a straight account of Bruner's non-mathematical study of strategy selection provides a moment of relaxation ! The second part deals with " simulators in the school setting " and offers, amongst others, introductions to information theory, statistical decision and game theories and systems analysis and a longer account of computer simulation of human verbal learning and concept learning and model of systems.

Because the models selected are of very recent development—the author points out that " over 90 per cent are no more than 10 years old ; of that group nearly 75 per cent are less than 5 years old "—and because of the considerable amount of mathematics involved, especially in the first section, this is likely to prove difficult reading for many educational psychologists. A mathematician with little or no knowledge of psychology is likely to make more sense of it—certainly at a first reading—than a psychologist with little or no knowledge of mathematics. This review is written from the standpoint of the second kind of reader !

From this standpoint, a text such as this which aims to introduce " relatively unfamiliar modes for analysing psychological processes," succeeds if it can convince that the strenuous struggle to master the new and especially mathematical ways of thinking necessary to make sense of these unfamiliar modes is worthwhile. On this criterion I think it is only a partial success. Partly, I think, because it attempts to introduce too many new ideas, partly because the relevance of these ideas to school learning is hinted at rather than discussed explicitly. Possibly this is the state of the science not the fault of the author. But certainly, fewer models, with the underlying theories more fully taught and the implications for school learning more clearly elaborated, would have made this a different and more valuable book.

Nevertheless, this text has many attractions even for the comparatively unsophisticated reader. It does convey the feeling of excitement at the prospect of the development and expansion of these and other models in the understanding of human learning ; its brief introductions to completely new techniques such as Bayesian statistics, Graph theory and so on I found helpful ; it is a useful reference source to some of the important new work in this area. DAVID EVANS.

SWINGLE, PAUL G. (1968). *Experiments in Social Psychology.* London : Academic Press, pp. 258, 70s.

This book is one of a series on Social Psychology under the general editorship of Leon Festinger and Stanley Schachter. Apart from the preface, and introductory chapter, an appendix and the usual indices, it consists of seven chapters amounting in all to 220 pages. Four of these run to 36-40 pages ; the others to 22. Each of these chapters follows a similar pattern. There is a short introduction to the topic, an outline of an experiment to be performed by undergraduates and a selection of relevant journal articles. The seven experiments concern petition signing, role playing, observational bias, co-operative group thinking, the formation of coalitions, operant control of group decision making, and bargaining behaviour. The purpose of this book is to stimulate undergraduate interest in experimental human social psychology.

The reader's appetite is whetted by a complete reprint of Stanley Milgram's article " Some Conditions of Obedience and Disobedience to Authority," which appeared in *Human Relations* (1965). That article describes an exciting series of experiments at Yale University in which the subjects were led to believe that they were assistant experimenters in an investigation of the effect of punishment on remembering, whereas in fact they were the subjects, and the object of the investigation was to discover the extent to which they would comply with the experimenter's instructions and administer increasingly powerful electric shocks. Almost 1,000 adults were studied individually and " with numbing regularity good people were seen to knuckle under the demands of authority and perform actions that were callous and severe. Men who are in everyday life responsible and decent were seduced by the trappings of authority, by the control of their perceptions, and by the uncritical acceptance of the experimenter's definition of the situation, into performing harsh acts" (p. 22). An investigation like that with findings like these could hardly fail to provoke lively interest. Methodologically, too, it makes good reading.

" Conformity and Character " by Richard S. Crutchfield (1955); " The Effect of Effort and Improvisation on Self-Persuasion Produced by Role-Playing " by Philip G. Zimbardo (1965); " On the Social Psychology of the Psychological Experiment " by Martin T. Orne (1962); " The Effect of Group Participation on Brainstorming Effectiveness for Two Industrial Samples " by Marvin D. Dunnette, John Campbell, and Kay Jaastad (1963) are among the other articles reproduced. It is good to have these also in a form which makes them readily available to students. Professor Swingle has succeeded in his aim of producing a book to stimulate undergraduate interest in experimental human social psychology.

While we hope this book will be widely used, we cannot but reflect on a most unfortunate effect of such use, namely, that naive subjects will be harder to come by! This book may, paradoxically, have the effect of making more difficult the provision of the experimental training it is designed to encourage!

Educational philosophers will wish to reflect on the implications of the experimental data and may wish to consider what educational policies might be pursued to render men less vulnerable to irrational or unreasonable social pressures. Educationists who are experimentally inclined may wish to undertake the complementary task of determining in which ways and to what extents exposure to different educational processes tend to make men compliant. HENRY H. FERGUSON.

THOMSON, R. (1968). *The Pelican History of Psychology.* Penguin Books, pp. 464, 7s. 6d.

This history starts traditionally, if somewhat arbitrarily, with the philosophica and physiological writings of the 19th century. The first section of the book traces the emergence of experimental psychology, and then describes its various manifestations in Europe and America. The section closes with a retrospective look from the position at the beginning of the first war. Developments in eleven areas (e.g., Behaviourism, Psycho-Analysis, Child Psychology) are then described for the inter-war period, and a second retrospective look is taken from the vantage point of 1940. The final section consists of a very brief (32 p.) sketch of post-war developments.

The historical treatment amounts to much more than a catalogue of book titles and dates; biographical detail is introduced, and brief but clear summaries of research findings are also included. Just occasionally, the summary is so brief as to distort. Thus the section on Piaget (p. 361-362) refers merely to the first three books, and gives no indication of his later output, nor his central importance for contemporary child psychology. The sketch of post-war developments makes no reference to recent developmental research, and the reader is left with the erroneous impression that Piaget's contribution has been " interesting attempts to involve children as subjects for laboratory experiment."

Such lapses are fortunately rare, and the student who wishes to understand why contemporary psychology has assumed its present form, can be strongly recommended to buy this book. On the other hand, anyone wanting to read a historical treatment in depth will be disappointed. There is little new material, and the more recent literature published outside Britain or America is largely neglected. Pavlov is the sole representative of Russian psychology, and one searches in vain for hints of what has been happening in Europe as a whole, to say nothing of the truly international picture. There surely exists a compromise between general neglect and the admittedly impossible aim of exhaustive coverage.

Accepting that the author has set out to write an introductory history for the layman and student, the book is a welcome addition to the Penguin library. A useful classified bibliography is provided. A. L. WILKES.

WASON, P. C., and JOHNSON-LAIRD, P. N. (Ed.) (1968). *Thinking and Reasoning.* OLDFIELD, R. C., and MARSHALL, J. C. (Ed.) (1968). *Language.* London: Penguin, pp. 428, and pp. 392, 8s. 6d. each.

These books, from the Penguin set of Modern Psychology Readings, present a clear picture of present-day theories and approaches in certain aspects of their subjects; they emphasise the value of structure and models, and reveal the complex processes involved in problem-solving and in the acquisition and use of language. Both books show the importance of interdisciplinary collaboration and implicitly point to a wider basis for the education of those involved in psychological research and of those engaged in applying the results of this research. Each book pays some attention to the relation between language and thinking (e.g., in concept formation, in dealing with negative information), but further consideration would have been valuable (e.g., in the use of symbols, verbalisation and logic).

The subject matter of each book is split up into sections; in addition each has a short historical introduction, author and subject indexes and a helpful list of references.

Thinking and Reasoning. This book concentrates on experimental studies of how people solve problems; the importance of structure and re-organisation stands out. The Behaviourist tradition has not been included.

The problem-solving section deals with some of the variables that affect a person's search for a solution, e.g., the value of hints, functional fixedness. The sections on deductive and inductive reasoning reveal in a telling way some of the psychological and social factors that influence logical thinking and the use of generalisations which go beyond the data. Section 4 contains papers on strategies used for matching problems and forming concepts, and in Section 5 are some stimulating articles on information-processing models and computer simulation. The last section deals with cognitive development in children and there is a paper on the place of notation in learning mathematics.

Most of the experimental work mentioned is with university students or adults: of the 29 papers three concern experiments with children and there are four papers in the cognitive development section. While the book gives a stimulating survey of many aspects of thinking this reviewer feels more importance should have been given to creative thinking, the hypothetic-deductive method and transfer of training.

Language. This book deals with recent developments in the psychology of language, and is a happy blend of theory, models, methods and experiments. It presents an exciting picture of problems and possibilities in this field of research.

The first section deals with the acquisition and development of language in children. The second section, on perception and production, includes an account of recent techniques in the study of the physiology of the human voice system, a model for language behaviour and the effects of context and irrelevant material on listening. Some implications for linguistic research from a generative grammar framework are in Section 3, and there is also a paper on the possible contexts which facilitate response to negative statements. The section on quantitative and mathematical aspects of linguistics includes a paper which stresses the need in computational linguistics (especially machine translation) for an adequate basis in language structure. The final section includes papers on the application of Head's 'Schema' to the interpretation of speech mechanisms, on cerebral dominance and an overview of current thought on aphasia.

Some of the aspects of language not considered are: language teaching, language in its social setting, the testing of spoken English and animal communication.

One feels, in these two books, as in other books of readings, that the reader would have been helped by the editors' comments on some aspects of their subjects—of the worth of certain theories and approaches—and also on the applications of research investigations.

Both books have much to offer to teachers and teachers-in-training and to those concerned professionally with thought and communication. They will also be of interest to the educated layman, though 'Language' requires a greater introductory knowledge.

J. REYNOLDS.

WRIGHT, G. N., and TROTTER, A. B. (1968). *Rehabilitation Research.* Madison : University of Wisconsin, pp. 451,

For those working in rehabilitation units, and for other specialists concerned with rehabilitation problems, this book will have much to commend it. It summarizes 97 recent American studies conducted under the auspices of the Federal Vocational Rehabilitation Administration and covers a daunting range of problem areas. For example, it extends from the adjustment difficulties of cardivascular cases to those associated with mental retardation, and from those relating to the use of prosthetic devices with geriatric patients to the rehabilitation difficulties of the facially disfigured. In between, there is a great deal that is relevant to the psychiatrically disabled and those with sensory impairments. But, because of the wide coverage involved, the description of projects is somewhat terse, though sufficient to give some idea of the essentials of the research methodology and the salient features of the results. Of necessity, much of the book is concerned with specifically American conditions and much of what is written referring to workmen's compensation and the structure of rehabilitation services will only have minimal value outside of the United States. However, on the whole, it will probably prove to be a useful and interesting book to the specialist. BRIAN WELLS.

SCOTTISH COUNCIL FOR RESEARCH IN EDUCATION (1968). *Rising Standards in Scottish Primary Schools.* London : University Press, pp. 140, 22s. 6d.

This publication presents a report on the changes which have taken place in the attainments of Scottish 10-year-olds over the ten-year period 1953-63. Tests in English and Arithmetic (reproduced in the book but separately available from University of London Press) were administered to all 10-year-olds in 1953 and to a representative sample in 1963. The selection of this representative sample employed the techniques of cluster sampling which are clearly explained in a chapter entitled " Notes on the Experimental Design." The performance of 1963 10-year-olds is higher than that of the 1953 group in all the tests administered—Mechanical Arithmetic, Arithmetical Reasoning, English Usage and English Comprehension. It is stated that this improvement is roughly equivalent to the progress made in six months by an average 10-year-old pupil.

Gains are presented for boys and girls separately, for all levels of ability, for the four areas of the country (cities, large towns, small towns and other areas), for 10 regions in the country and for all sizes of schools. No significant differences in gains are reported between the sexes, among the regions, or in different sizes of schools but pupils resident in ' other areas ' have made significantly higher gains than city pupils. In addition the trend is for pupils in cities to gain less than pupils in large or small towns. The one-teacher schools maintain the high standards reported in the 1953 survey.

What accounts for the gains ? The report discounts the influence of test sophistication, but shows that in the areas where attainment tests were used for transfer purposes, gains were twice as large as in areas not using these tests. Some weight must be given to the fact that many textbooks used in 1963 made greater use of the objective test style of question and answer than was common in 1953.

This publication comes at a time when many Scottish teachers are concerned about standards and the results reported may well be used in support of modern methods. Nevertheless, considerable changes have taken place since 1963 and it would be interesting to speculate what the results would be in 1973. The Arithmetic tests however will be inappropriate then and the English tests are now freely available. The phrase ' Rising Standards ' is of course relative to what was achieved in 1953 when some misgivings were expressed about attainment in certain parts of the tests. It is interesting that gains in Arithmetic were related to knowledge of tables of capacity, weights and measures and money, perhaps reflecting the much more practical approach in the school whilst computational errors in long division, subtraction with borrowing and long multiplication account for either a deterioration in performance over the 10 years or a below-average gain.

The publication reports a valuable survey of interest to all teachers and administrators. ALASTAIR MILNE.

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Books for review have been selected from the following.

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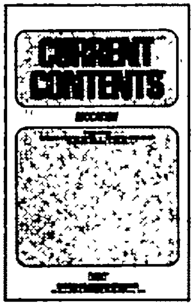

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THE COMPARATIVE EFFECTIVENESS OF SEVERAL SHORT-CUT ITEM ANALYSIS PROCEDURES

By I. M. CONNAUGHTON and L. S. SKURNIK

(*Examinations and Tests Research Unit, National Foundation for Educational Research*)

Summary. A comparison was made between the facility and discrimination values produced by a computer item analysis program, and those produced by several short-cut procedures based on Fan and Flanagan table values, phi and biserial correlations, normalised z and simple 27 per cent and 25 per cent difference quotients. The computer sample was composed of 584 GCE pupils who had taken the CP66 aptitude test. The short-cut sample consisted of 185 of these pupils. The CP66 item analysis results indicated that Fan and Flanagan tables gave ' accurate ' results in comparison with those produced by the computer. The very simple D indices, although more ' severe ' in discrimination standards than the Fan and Flanagan tables were also quite accurate, as were the phi index and the others reviewed. In general it was concluded that where computer facilities were not available for item analysis, short-cut methods could safely be used with minimum loss of accuracy of information even though some methods rejected more ' good ' items than other methods.

I.—Introduction.

The professional construction of objective tests requires the collection and review of statistical information regarding the operating characteristics of each test item that is proposed for use. This information generally takes the form of item facility and discrimination indices derived by item analysis. Usually such information is required quickly and it is therefore often produced by short-cut methods. Probably, in America at least, the best known short-cut item analysis methods utilise top and bottom 27 per cent sub-samples, selected on the basis of their total score on the test. This approach became widely accepted after 1939 when Kelley demonstrated that the lowest and highest 27 per cent of a sample are the optimum groups for use when item analysis data are to be obtained quickly for items of 50 per cent facility. In general, samples of 185 or 370 examinees are used in such analyses since 27 per cent of these numbers are 50 and 100 respectively, making it easy to calculate the percentage response of the sub-groups being studied.

Short-cut methods of item analysis are designed to reduce the amount of work required to produce information quickly about item operating characteristics. However, the advent of computers now makes it possible to obtain quickly facility and discrimination indices based on the responses of all pupils in samples of virtually unlimited size. Since computer item analyses can produce the most accurate picture obtainable of the characteristics of items, the question arises as to the relative quality of the results produced by short-cut methods. The present study was designed to shed some light on this question. The CP66 aptitude test was the instrument chosen for study. On average, each item in the test had been answered correctly by slightly more than 50 per cent of the pupils in the sample. The overall criterion of success employed was the total test score.

The Test.

The CP66 test has a time limit of 50 minutes and was used as a calibrating device in a study of the comparability of the grading standards of all the CSE and GCE Boards setting examinations in 1966 (Skurnik and Hall, 1969). It is composed of 90 multiple-choice questions, mostly of the five choice variety and half of the items are designed to measure verbal aptitude and half are meant to assess quantitative reasoning. Responses are entered on to a separate answer sheet which can be scored by optical scanners and computer, or by hand. There is no correction for guessing, and the test contains some element of speed, since only 23 per cent of the GCE examinees who took it answered all of the items, although 97 per cent of them answered three-quarters of the items. Further details about the test can be found in Skurnik and Hall (1969).

II.—METHODS OF ANALYSIS.

Computer analysis: The test results were first analysed on a computer at London University. Item facility and discrimination indices were produced for the CP66 test results of a population of 584 pupils taking GCE O-level in summer, 1966, who had been tested in their schools around Easter time. The facility values were based on the proportion of pupils attempting an item who gave a correct response to that item, and the computer was programmed to include a respondent as 'attempting' an item only if he answered the one immediately preceding it, or any following. The discrimination values were the biserial coefficients between item response and total score. Such procedures for calculating facility and discrimination have been applied in test development for many years and are generally accepted as useful techniques of analysis (Davis, 1951). The computer analysis was adopted as the criterion in the present study because the responses of all the examinees were analysed, and the precise biserial r was calculated, whereas in short-cut methods half of the available evidence is not used and the correlations are estimated. The answer sheets of the pupils in the short-cut samples were marked by hand, item by item, and the pupils' scores were compared with those produced when the answer sheets were machine-scored. Very few errors were found, and most of these arose from failures to detect correct answers when hand-scoring.

Short-cut methods: The short-cut methods of calculating facility and discrimination indices were all applied to a sample of 185 pupils selected randomly from the population of 584 candidates. On the basis of total score the 50 highest and 50 lowest pupils (27 per cent) and the 46 highest and the 46 lowest pupils (25 per cent) were selected from the 185 and their results were analysed by hand in a number of ways described below.

(1) *Fan table analysis.*

Special tables prepared by Chung-Teh Fan (1952) list item facility values based on the normal bivariate distribution, and discrimination values probably based on the biserial coefficient (the exact type of correlation coefficient is not clear). These tables were used because they are based on top and bottom 27 per cent groups, and because they list facility values which have been corrected to avoid errors which may arise as a result of using extreme (high and low) groups The tabled values are similar to those contained in abacs prepared by Flanagan (1939).

(2) *Flanagan table analysis.*

This table, described by Flanagan (1939), and published in Thorndike (1949) gives discrimination values which, according to Guilford (1954), are based on biserial coefficients of correlation between item and total score. This table, like the Fan tables, supplies results of comparisons between high and low 27 per cent groups and has been widely used for many years. Unlike the Fan tables, the Flanagan facility values in the present study were derived by simply averaging the correct responses of the high and low groups.

(3) *27D and 25D analyses.*

The facility values in these analyses were also obtained by averaging correct responses. The discrimination values were derived from the differences between the proportion of correct responses to each item achieved by the upper and lower groups. In the case of 27D the highest and lowest 27 per cent were used, and in the case of 25D, the highest and lowest 25 per cent were used. These simple techniques were tried out on the basis of favourable evidence reported by Ebel (1967) and Englehart (1965), among others.

(4) *Other discrimination indices.*

The analyses listed above were those of greatest interest in the present study and no further facility values were obtained. However, biserial, phi and normalised z coefficients of discrimination were calculated in order to see whether such indices would add extra information about the characteristics of the items to that provided by the discrimination indices described earlier The same top and bottom 27 per cent samples were used as before. The phi discrimination index was computed with the aid of the formula given in Guilford (1954).

$$\varnothing = \frac{\mathrm{Pu} - \mathrm{Pl}}{2\mathrm{pq}}$$

where p=the facility value of the item. The pq values used were those listed in Guilford (1965, p. 588). The biserial index was also computed with the aid of an abac given in Guilford (1954). The z coefficient was a conversion of the Flanagan correlation results to a corresponding Fisher's z coefficient (Guilford, 1965, p. 589).

The results of the comparisons of these various indices with each other are presented below. Since the short-cut analyses were all performed on basically the same sample of scripts, it was not possible to obtain estimates of errors arising from the sampling for comparison with errors arising from different methods of analysis ; this point should always be kept in mind when the results are being considered.

III.—RESULTS.

The Samples.

The data in Table 1 indicate that the mean test scores and standard deviations of the computer population and the 185 sample were almost identical.

TABLE 1

CHARACTERISTICS OF THE CP66 : POPULATION AND SAMPLE RESULTS, 1966 GCE EXAMINEES

	Mean	s.d.	Reliability (KR20)	Sample size		
				Boys	Girls	Total
Population (Computer) ..	56·22	13·30	0·91	276	308	584
Sample (Short-cut methods)	56·90	13·53	0·93	86	99	185

This finding suggested that the item analysis results for the two sets of data might also be similar providing that the different item analysis methods were comparable. The item facility and discrimination results for the various indices were therefore reviewed in detail in the remainder of the analysis.

Item Facility Indices.

Item facilities were calculated by the computer on the population and estimated by the short-cut methods on the sample. The values obtained were then correlated in order to provide an indication of the degree of similarity between the various indices. The intercorrelations obtained are listed in Table 2. The short-cut methods all yielded virtually identical facility values which, although less highly correlated with the computer index than with each other, were still in good agreement with it. Thus it seems that the ranking of items in terms of facility which was produced by one short-cut method was similar to that produced by any other, with all of them exhibiting some differences from, but general agreement with, the computer index. The question of the utility of the short-cut facility values will be discussed more fully later in the report.

TABLE 2

Correlations Between Facility Indices.

	Fan	Flanagan	27D	25D
Computer	·87	·88	·88	·88
Fan		1·00	1·00	1·00
Flanagan			1·00	1·00
27D				1·00

Item Discrimination Indices.

The intercorrelations between the various discrimination indices are listed in Table 3.

TABLE 3

Correlations Between Discrimination Indices.

	Fan	Flanagan	Phi	Z	Biserial	27D	25D
Computer (r Bis)	·75	·76	·60	·75	·74	·72	·72
Fan		·99	·80	·98	·98	·87	·87
Flanagan			·80	·99	·99	·87	·87
Phi				·82	·77	·87	·87
Fisher's Z					·98	·88	·88
Biserial						·83	·83
27D							·99

The correlations between the computer analysis and the other analyses, although high, could have been higher. This is most clearly indicated by the high correlations of the short-cut results among themselves. In general, the Flanagan and Fan results appear to have most in common with both the computer and other methods of analysis but sampling errors are large and significance tests have not been made. The phi coefficient appears to have least in common with the other results. With the possible exception of the phi coefficient, all of the short-cut methods seemed to be comparable, findings which are very much in agreement with Englehart (1965), and others who have investigated different methods for analysing items.

Identification of 'good' and 'bad' items.

So far the results have been discussed in general terms. However, item analysis is usually undertaken with the specific purpose of selecting or rejecting items according to the contribution they appear to make to the effectiveness of a test. The following section will therefore discuss the utility of the various facility and discrimination indices in selecting 'good' and rejecting 'bad' items. First, however, the criteria applied will be briefly described.

Although criteria for assessing effectiveness are almost inevitably subjective, eventually, a choice must be made. For the purposes of this analysis, therefore, items were to be rejected as too difficult if their facility values were less than 10 (that is to say, less than 10 per cent of the population or sample obtained the correct answer), or too easy, their facility being greater than 90. The lowest acceptable discrimination value was arbitrarily set at a correlation of 0·30 for all methods. These standards were selected both because they are easy to apply, and also because they have been found to be useful on other occasions when tests were reviewed or developed (Davis, 1951). Other, more sophisticated procedures could, of course, have been used, including that, for example, of Englehart (1965), who varied the size of phi and D discrimination index criteria according to the facility value of the item being assessed. However, such an approach introduces extra work for the user of the index and it was not used in the present experiment, since it was felt that if short-cut methods are not straightforward they lose some of their appeal.

Facility results.

Table 4 gives the findings. The first row lists the number of items accepted by the different methods when the facility limits were set at 10 or greater and 90 or less. The second row indicates the number of items out of those which were rejected (values less than 10 or greater than 90) which were in common with those rejected by the computer. The third line lists the total number of items—out of 90—which were classified in common with the computer results.

TABLE 4

ITEMS ACCEPTED IF FACILITY WAS GREATER THAN 10 OR LESS THAN 90.

Total items in test=90	Computer	Fan	Flanagan	27D	25D
Number of items accepted ($p > 10$ or < 90)	82	79	81	81	82
Number of items rejected in common with the computer	(8)	7	6	6	6
Total number of items classified in common with the computer	(90)	84	85	85	86

It is clear that there is good agreement between all of the indices. What differences there were between the short-cut and computer facility results appeared mainly in the last thirteen items of the test. The discrepancies there arose because of the drop in the numbers of pupils attempting these, in comparison with earlier items. The short-cut methods seemed to exaggerate the difficulty of these last items in comparison with the computer. As stated earlier, the latter was programmed to include a respondent as 'attempting' an item only if he answered the item immediately preceding or any following. The short-cut methods treated all 'omits' as 'wrongs.' Thus, whereas the computer allowed for omits in calculating facility, the short-cut methods did not, often making items omitted by a large number of pupils appear to be very difficult. Since the CP66 was moderately speeded, the short-cut methods employed were not suitably applied to the last dozen items.

Discrimination results.

The discrimination index results for $r=0{\cdot}30$ are summarised in Table 5.

TABLE 5

ITEMS ACCEPTED IF DISCRIMINATION WAS EQUAL TO, OR GREATER THAN 0·30.

Total items in test=90	Computer	Fan	Flanagan	Phi	Z	r Bis	27D	25D
Number of items accepted ($r > 0{\cdot}30$)	76	76	78	68	78	78	58	59
Number of items rejected in common with the computer ($r < 0{\cdot}29$)	(14)	8	8	10	8	8	11	11
Total number of items classified in common with the computer . . .	(90)	78	80	74	80	80	66	67

As indicated, the D indices were 'severe' in that although they rejected 11 items in common with the computer, they also rejected an extra 21 (27D) or 20 (25D) which were accepted by the computer. On this evidence, therefore, when the minimum acceptance standard was set at $r=0{\cdot}30$, the phi and D indices seemed to be the least effective of the short-cut methods.

In order to clarify further this variation in efficiency from index to index, the distributions of the various indices for items with a discrimination value of 0·29 or less were reviewed. It was found that in the case of the 27D, 25D and computer indices, the rejected items tended to cluster towards the border-line of the rejection-scale; whereas the items rejected by the other indices were more widely spread below 0·29. This finding suggested that it might be essential to vary the short-cut selection standards to try to improve the agreement between these indices and the computer and the results of this exercise are presented in Table 6. The computer standard was maintained at $r=0{\cdot}30$ throughout. The first column of the table (A) lists the number of items (out of 90) accepted by each short-cut method. The difference between the figure listed (for example, 78) and the total number of items in the CP66 test (90) indicates the number of items ' rejected ' by each method. The second column (B) shows how many items of those 'rejected ' by the short-cut methods were in common with those ' rejected ' by the computer. The third column (C) lists the total number of items (out of 90) which were classified in common with the computer.

The findings listed in these columns suggest that the selection standard which is most effective in selecting only ' good ' items and rejecting all ' bad ' items (as classified by the computer) may vary from method to method. If the 27D results are examined, for example, it will be seen that at the 0·29 level this index tended to ' reject ' a large number of ' good ' items and missed three ' bad ' items. On the other hand, at the 0·09 level, the index tended to ' accept ' rather too many ' bad ' items, nine out of the 82 ' accepted ' items being misclassified, even though five out of the nine ' rejected ' items were in common with the computer. The most ' effective ' standard for this and the 25D index in terms of the acceptance of ' good ' and rejection of ' bad ' items seems to be, for this sample, somewhere about the 0·14 to 0·19 level. The asterisks on Table 6 indicate these and the other standards which appeared to give results in closest agreement with the computer results, the computer ' acceptance ' standard (r=0·30) and number of items ' rejected ' (n=14), having been held constant while the short-cut standards were varied. It will be seen that the Fan, Flanagan, Biserial r and Z indices apparently functioned best some where between r=0·24 and 0·29. The phi index results, on the other hand, were fairly similar to the ' D ' results, and the most effective rejection point for this index was somewhere between 0·19 and 0·24. Of course, another sample of scripts might have suggested other limits to these indices.

TABLE 6

AMOUNT OF AGREEMENT BETWEEN COMPUTER AND SHORT-CUT METHODS IN TERMS OF NUMBERS OF ITEMS ' ACCEPTED ' AND ' REJECTED.' COMPUTER r=0·30 THROUGHOUT.

Rejection Standard <	Fan			Flanagan			Phi			Z			r Biserial			27D			25D		
	+A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C
0·29	76*	8	78	78*	8	80	68	10	74	78*	8	80	78*	8	80	58	11	66	59	11	67
0·24	78*	7	78	79*	7	79	74*	9	78	79*	7	79	80*	7	78	63	11	71	63	11	71
0·19	80	5	76	81	5	77	78*	7	78	81	5	77	81	5	77	72*	9	76	72*	9	76
0·14	82	4	76	83	4	77	81	5	77	83	3	77	84	2	78	75*	6	77	78*	5	78
0·09	86	3	78	87	3	79	86	4	80	87	4	79	88	2	78	82	6	80	82	5	78
0·04	88	2	78	88	2	78	88	2	78	88	2	78	88	2	78	87	3	79	87	3	79

+Code : A=number of items ' accepted ' by short-cut method.
B=number of ' rejected ' items in common with those ' rejected ' by the computer.
C=total number of items (out of 90) classified in common with the computer.
*=most suitable selection standard.

IV.—DISCUSSION AND CONCLUSIONS.

In retrospect, this study suffered from two major defects. The first was the lack of replication. Until further, similar, item analyses are performed the evidence reported should be treated with caution, since the results obtained could have arisen in some measure from random factors in the data. In addition, the test was rather speeded, making it difficult to describe the facility and discrimination of the last 20 items. A further study should preferably include analysis of the variance between methods and between samples.

Overall, in spite of the defects of the present study, it seems fair to say that it has been shown (again) that short-cut item analysis methods give results similar to those produced by more exact procedures. In general the Fan and Flanagan tables seemed to be the best short-cut methods to use of those studied and perhaps gave the most effective results. As far as the selection of ' good ' items is concerned, the facility results were very similar for all of the indices. The discrimination results suggested that Fan and Flanagan tables were most effective at the 0·30 level, when the minimum standard for the computer was also 0·30. The biserial and z coefficients operated in a smilar manner but the phi coefficient and the D indices seemed to be more effective at a lower ' acceptance ' level. The 25D results were, incidentally, very similar to the 27D results, which suggests that the 25D method of item analysis could be used instead of the 27D method if there was a wish to further simplify item analysis procedures. Whichever short-cut method is used, care needs to be taken in the application of these procedures, especially when a test consists of few items. Inaccuracies in short-cut methods are likely to be greater with tests containing a small number of items since both facility and discrimination values tend to fluctuate widely from sample to sample.

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VERBAL RECEPTION, GUIDED DISCOVERY AND THE LEARNING OF SCHEMATA

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SUMMARY. Verbal reception and guided discovery techniques of teaching are compared in a classroom situation for effectiveness in promoting the formation of stable, usable, cognitive schemata in comparable groups of university students. The results indicate that explicit direction can produce performances superior to those resulting from a guided discovery approach for immediate recall, delayed retention and transfer. Tentative explanations of these findings are discussed.

I.—INTRODUCTION.

Two related topics of interest to educational psychologists are those of meaningful *versus* rote learning, and discovery *versus* reception techniques of teaching.

Skemp (1962) and Ausubel (1963) provide and discuss experimental evidence on the greater efficiency of meaningful learning for initial learning, retention and transfer. They also elaborate the characteristic 'cognitivist' view that, by definition, for new learning to be potentially meaningful, it must be capable of being related in a non-arbitrary manner to an existing cognitive schema or structure.

The deliberate attempt to assist the development of these schemata is a large part of the function of teaching but, as yet, there appears to be little or no agreement on the most effective techniques to use. Whether it is better for an individual to work things out entirely by himself (pure discovery), with prompts and cues (guided or intermediate discovery) or be presented with the whole structure ready made (pure reception) is a matter of continuing empirical enquiry. Available data are limited (Craig, 1956; Corman, 1957; Kittell, 1957; Kersh, 1958; Haselrud and Meyers, 1958; Wittrock, 1963; Guthrie, 1967) and the issue is confused by the champions of discovery methods (especially for teaching science) claiming that for a child to find out something by himself is 'obviously,' even axiomatically, preferable, e.g., "... if man's intellectual excellence is the most his own among his perfections, it is also the case that the most uniquely personal of all that he knows is that which he has discovered for himself" (Bruner, 1961).

Ausubel (1963), in a book including an exhaustive summary of the available evidence, censures the uncritical acceptance of discovery and denigration of verbal reception methods, and urges a more balanced assessment of the situation. "Careful examination of what research supposedly 'shows' in this instance yields these three disheartening conclusions: (*a*) that most of the articles most commonly cited in the literature as reporting results supportive of discovery techniques actually report no research findings whatsoever, consisting mainly of theoretical discussion, assertion, and conjecture; descriptions of existing progams utilizing discovery methods; and enthusiastic but wholly subjective testimonials regarding the efficacy of discovery approaches; (*b*) that most of the reasonably well-controlled studies report negative findings; and (*c*) that most studies reporting positive findings either fail to control other significant variables or employ questionable techniques of statistical analysis" (p. 165).

II.—EXPERIMENTAL.

(*a*) *General.*

This experiment is an attempt to provide further information on the relative effectiveness of verbal reception and discovery techniques, in this case guided discovery, as methods of bringing about the formation of stable, usable, cognitive schemata in students who are assumed to have reached the stage of formal operations in Piaget's scheme of mental development.

However, the magnitude of the task clearly indicates that a single exploratory experiment such as this must be limited both in design and application, and these limitations are outlined below.

(i) All subjects taking part in the experiment were post-graduate, full-time students, studying for the Diploma in Education in the Department of Education of the University of Adelaide.

The nature of the sample imposes limitations on the applicability of the results of the experiment. It must be remembered that these are students who, because of the methods of teaching prevalent in many schools and, perhaps even more pronouncedly, in universities, probably already have had considerable practice, and success, at the method of verbal reception learning. The results, strictly, are applicable only to other groups of students at a similar stage of learning, and with a similar learning history, to those in the sample. Any extrapolation to other groups of students and other situations is liable to involve errors.

(ii) The same amount of time was used for teaching by each method.

This limitation was imposed because it was considered a more realistic situation than one in which the task is learnt to some initial criterion level of excellence.

(*b*) *The Sample.*

It is the policy of the Department to assign students to tutorial groups at the beginning of the year, and it was these tutorial groups who were used for the experiment.

In 1968, six tutorial groups were arranged, each containing a maximum of 12 students and a fairly similar number of specialists in the different subjects (historians, mathematicians, chemists, musicians, etc.). However, only the scores of the 59 students present throughout the entire experiment were used in the analyses of the results. 32 of these were in the three tutorial groups, containing 12, 12 and 8 students respectively, taught by the method of guided discovery; 27 were in the three groups, containing 10, 9 and 8 students respectively, taught by the verbal reception method.

(*c*) *The Learning Task.*

Following the idea of Skemp (1962), it was decided that the best method of obtaining a learning task equally unfamiliar to all students probably was by the invention of a purely artificial schema. The basic elements of the schema were 17 symbols each associated with a separate meaning carefully chosen to allow the production of new meanings by combination of the different symbols two three, or more at a time, according to specific but simple rules. The elements of the schema and the rules of combination of symbols are given in Figure 1.

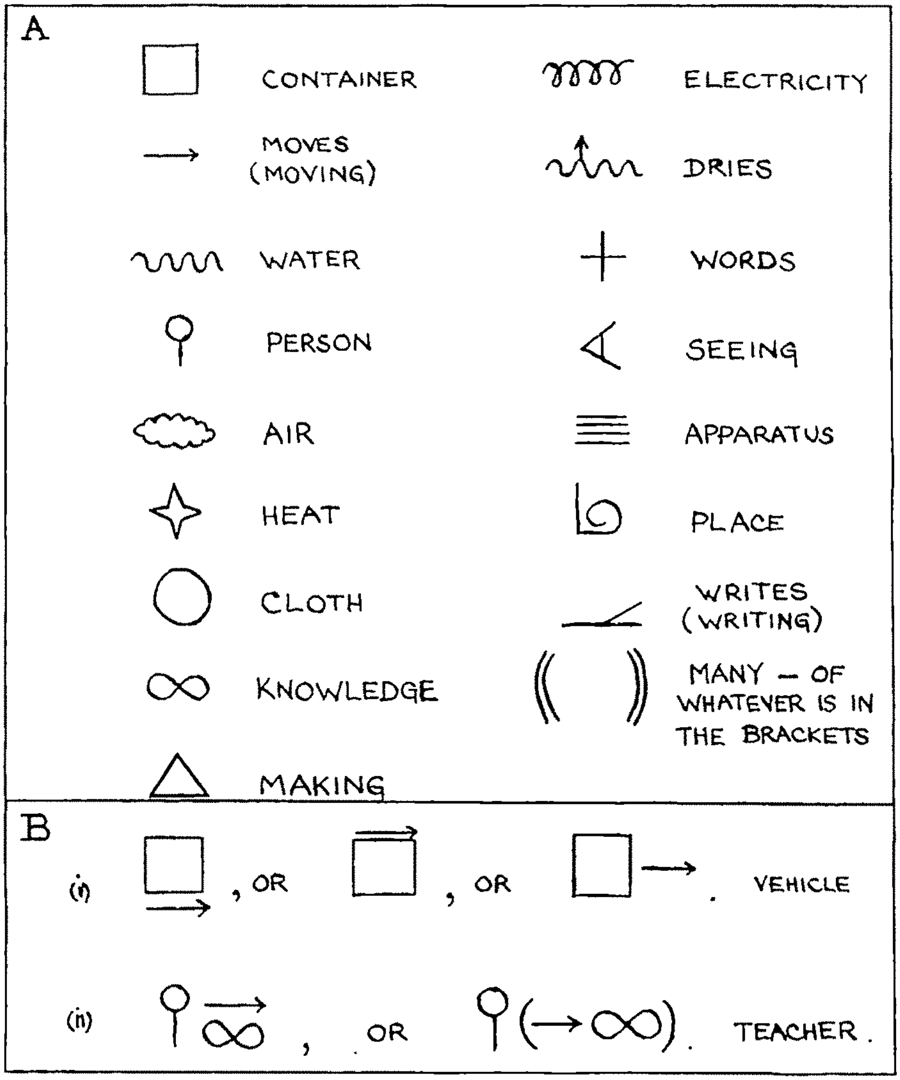

FIGURE 1

Basic Elements of the Schema (A) and Rules of Combination of the Symbols (B).
Rule (i)—no distinction is made between the three forms of representation shown when, as in this case, no ambiguity of meaning is introduced.
Rule (ii)—there are two methods of connecting two or more symbols meaning a single thing, in this case teaching, when they form part of a larger symbol group, in this case meaning teacher.

Even in a situation such as this, however, the possibility still exists that the basis of the schema will be known better by some students than others because of the difference in their experiental backgrounds. For example, the presence of symbols and their required manipulation in the schema used in this experiment might be thought advantageous to students of science. For this reason, and also because it was considered that the two groups (science and non-science) might respond differently to the two methods of instruction, test scores were classified by degree course (science, B Sc. *versus* non-science, B.A. and B.Mus.) as well as by methods of instruction for the purpose of analysis.

(*d*) *Methods of Presentation of the Schema.*

(i) *Verbal Reception Method.* The verbal reception technique was relatively easy to standardize for the three groups.

A large sheet of white paper on which the 17 basic elements of the schema were clearly printed in black texta-colour was taped, without comment, on to a blackboard in front of the appropriate tutorial group. A carefully prepared lecture was then read to the students briefly explaining the schema and the method of building up new meanings by combining the basic elements in certain ways. This was illustrated on the blackboard by 14 examples of simple symbol combinations and their meanings. (See Appendix).

At the end of the 14-minute lecture the students, who had been provided with paper, were allowed a further 15 minutes in which to learn the basic elements of the schema, the 14 examples of meaningful symbol groups, and to practise the building of more complex groups. When the 15 minutes had elapsed the schema and examples were removed from the board, and the practice notes of the students collected. This was their only contact with the original material, apart from subsequent tests.

(ii) *Guided Discovery Method.* Although the general technique of question and answer used for guiding discovery of each of the three groups was the same, it cannot be claimed the method was standardized in the same way as the verbal reception method in which each group received precisely the same set of words.*

Each student in the appropriate tutorial group was given a sheet of paper on which were printed the 14 combinations of basic elements of the schema, and their associated meanings, which were given to the verbal reception groups as examples of how new meanings could be built up by symbol combination. These included the possible variations in method of presentation, allowed by the rules of combination given in Figure 1, which symbolized the same meaning.

When the sheets had been given out, the group were told that their task, initially, was to discover the meanings of the 17 basic elements of the schema, and the rules for building up new meanings by combining any number of these elements. They were told also that when they had discovered these things they would have to learn them, to learn the 14 examples of symbol combinations which they had been given, and to practise writing new symbol combinations and associated meanings.

The group were then asked for any ideas on how and where to start the task of discovery. All groups started by commenting on the element——→, which was common to many of the symbol combinations given, and which they readily associated with the meaning ‘moves’ or ‘moving.’ After that point the course taken by each group differed, but each followed a typical technique of interaction of ideas through question and answer—question stimulating answer, which provoked a further question, until the group eventually converged on to the desired general meaning of the element under discussion. Each student made a record of the basic elements and their associated meanings as these were discovered. In each case the experimenter was able to complete the task on, or very close to (within ±½ minute) the allotted time of 14 minutes.

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* Even in the case of the verbal reception groups, of course, it would be untrue to say that each group, or even each member of one group, received precisely the same stimuli, even if they heard the same words.

As in the case of the verbal reception groups. at the end of the period of teaching the students were allowed a further 15 minutes in which to learn the schema and examples, and to practise the writing of new symbol combinations. When the 15 minutes had elapsed all papers were collected, and the students not allowed further contact with the original material, other than in tests of course.

To ensure, in so far as this was possible, that no group gave any indication of the task to be learnt to any other group, the co-operation of all students was enlisted not to discuss the experiment with anyone, even members of their own group. Fortunately, because of the maturity and professional nature of the groups involved, this was a relatively easy undertaking, and, it is believed, a successful one.

(*e*) *Testing.*

To investigate the possible differences in effect of method of presentation of material on its learning by students three tests were used, each containing two related subsections examining, respectively, recall and application, i.e., ability to extend the schema in an internally consistent manner. Test 1 was given immediately after the initial half-hour of learning and practice, Test 2 one week later, and Test 3 ten weeks after the initial learning period. No attempt was made to measure any possible difference between the verbal reception and guided discovery groups in their subsequent ability to impose structure on tasks of a similar nature.

Recall was examined by requiring the students to write down the associated meaning or symbol(s) when cued by the other member of the symbol(s)—meaning pair for each of the 17 basic elements of the schema and 14 examples of simple symbol combinations. Five minutes were allowed for the 31 answers.

The application section of each test was divided into two parts. In the first part, the students were required, in three minutes, to make up symbolic representations of five meanings which were given to them, e.g., evaporation, ship, mobile library, electric fan, water pump, tourists, and aircraft factory were a few of the meanings used. In the second part, five symbol combinations were presented and, again in three minutes, the students were required to work out appropriate meanings. A few examples of this latter group are given in Figure 2.

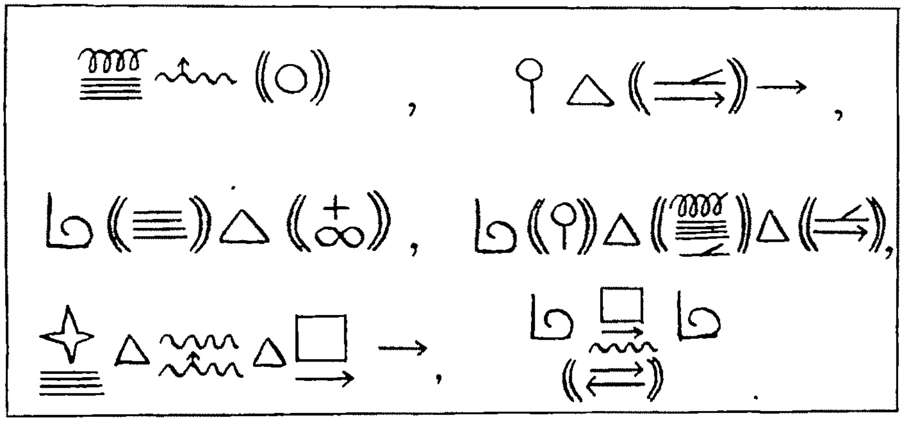

FIGURE 2

EXAMPLES OF SYMBOL COMBINATIONS USED IN THE TESTS OF APPLICATION

An attempt was made to construct three tests of equal objective standard of difficulty. This was an easy matter in the examination of recall, only requiring alteration of which symbols and which meanings should be given as cues, but, unfortunately, whether this was achieved for the application questions cannot be known with certainty—a difficulty having implications discussed later in the paper.

TABLE I

MEAN SCORES AND STANDARD DEVIATIONS (GROUPS COMBINED) ON RECALL AND APPLICATION TESTS · VERBAL RECEPTION METHOD AND GUIDED DISCOVERY METHOD.

		Verbal Reception		Guided Discovery	
		Recall*	Application	Recall*	Application
Test 1	Mean	·8292	6·72	1·2361	5·67
	Standard Deviation ...	·5924	1·29	·6299	1·51
Test 2	Mean . ..	1·2136	6·22	1·8028	3·91
	Standard Deviation ...	·9271	2·10	·9332	2·37
Test 3	Mean	23·52	5·80	20·33	4·55
	Standard Deviation ..	5·15	2·23	5·80	2·63

* Four places of decimals have been used for reporting the results of all calculations involving the logarithmically transformed recall scores from tests 1 and 2.

Note that the means and standard deviations reported for the recall scores of tests 1 and 2 are for the logarithmic transformations of error+1 scores not actual scores.

Students were given no indication of how many tests they would receive, and the question, therefore, arose of possible differences in conscious practice of the scheme by the verbal reception and guided discovery groups. Replies given anonymously to a short questionnaire revealed no difference in amount of practice, but differences consistently favouring the guided discovery method were found in the degree of involvement of the groups. Perhaps, as proposed by Kagan (1966), deeper involvement is a product of the extra intellectual effort required by attempted discovery.

III.—RESULTS.

A two-way analysis of variance was carried out on the scores obtained from each test. Raw scores were used except for the recall scores of Tests 1 and 2 where normality of the distributions and stability of the variances was achieved by transforming the error +1 scores to logarithms. The addition of one error to each error score was necessary to avoid the impossibility of transforming an error score of zero to a logarithm. The results of the analyses are presented in Table 2.

TABLE 2

RESULTS OF THE TWO-WAY CLASSIFICATION ANALYSES OF VARIANCE.

TEST 1.

	Recall				
	Sums of Squares	df.	Mean Squares	F Values	Signif. Level
Method : V.R. *v.* G.D.	2·4245	1	2·4245	8·49	P< ·01
Degree (Method Eliminated) : Science *v.* Non-Science	1·8146	1	1·8146	6·36	P< ·05
Interaction : Degree × Method	·4823	1	·4823	1·69	N.S.
Subgroups*	5·7091	8	·7136	2·50	P< ·05
Residual	13·4164	47	·2855		

* The subgroups referred to are the 12 science and non-science subsections of the six tutorial groups. The F values reported test the significance of the differences between the means of the three subgroups in each of the four sets of subgroups formed by the two-way classification by degree course and by method.

	Application				
	Sums of Squares	df.	Mean Squares	F Values	Signif. Level
Method : V.R. *v.* G.D.	16·16	1	16·16	8·18	P< ·01
Degree (Method Eliminated) : Science *v.* Non-Science	2·80	1	2·80	1·42	N.S.
Interaction : Degree × Method	·71	1	·71	·36	N.S.
Subgroups	17·64	8	2·21	1·12	N.S.
Residual	92·82	47	1·97		

TABLE 2—continued.

TEST 2

	Recall				
	Sums of Squares	df.	Mean Squares	F Values	Signif. Level
Method	5·0832	1	5·0832	6·55	P< ·05
Degree (Method Eliminated)	·6200	1	·6200	·80	N.S.
Interaction : Degree × Method	4·9180	1	4·9180	6·31	P< ·05
Subgroups	7·2064	8	·9008	1·16	N S.
Residual	36·6017	47	·7788		

	Application				
	Sums of Squares	df.	Mean Squares	F Values	Signif. Level
Method	78·55	1	78·55	17·00	P< ·001
Degree (Method Eliminated)	16·10	1	16·10	3·48	N.S.
Interaction : Degree × Method	5·98	1	5·98	1·30	N.S.
Subgroups	49·16	8	6·15	1·33	N.S.
Residual	217·14	47	4·62		

TABLE 2—continued.

TEST 3.

	Recall				
	Sums of Squares	df.	Mean Squares	F Values	Signif. Level
Method	149·06	1	149·06	5·37	P<·05
Degree (Method Eliminated)	50·43	1	50·43	1·82	N.S.
Interaction . Degree × Method	55·02	1	·55·02	1·98	N.S.
Subgroups	323·36	8	40·42	1·46	N.S.
Residual	1304·73	47	27·76		

	Application				
	Sums of Squares	df.	Mean Squares	F Values	Signif. Level
Method	22·86	1	22·86	4·11	P<·05
Degree (Method Eliminated)	17·36	1	17·36	3·12	N.S.
Interaction : Degree × Method	·68	1	·68	·12	N.S.
Subgroups	65·60	8	8·20	1·47	N.S.
Residual	261·17	47	5 56		

From Table 2 it can be seen that significant differences (P=·05 or less) in favour of the verbal reception method exist both for recall and application on all three tests. The implications, and possible explanation, of these major findings are discussed in Section IV.

Analyses of the results classified by degree course (Science *v.* Non-Science), with the effects of method eliminated, indicate the approximate equality of difficulty of the task for scientists and non-scientists—a significant difference between the groups (·01 <P< ·05) is evident only for immediate recall (Test 1).

A significant interaction effect (·01 <P< ·05) is present only for recall in Test 2. The non-significance of all other interaction effects indicates that scientists and non-scientists were affected similarly by the two methods of instruction.

From Table 2 it can be seen also that there is very little evidence for differences between the subgroups—a significant difference (·01 <P< ·05) occurs only in the analysis of scores for immediate recall (Test 1). The non-significance of all other subgroup tests indicates constancy of the teaching methods in their replication and homogeneity of the tutorial groups, apart from any possible differences due to degree course.

IV.—DISCUSSION AND CONCLUSIONS.

Subject to the several limitations acknowledged previously, the results of this study, when taken as a whole, suggest that instruction techniques of an expository or verbal reception nature can have greater pedagogic merit than has sometimes been assumed. This, of course, is no longer a unique conclusion ; a number of writers have expressed basically similar views (see, for example, Ausubel, 1963).

But what does seem of importance in the present study is the extent and the degree of superiority of the verbal reception approach relative to the discovery approach. While the non-comparability of various studies raises obvious difficulties, it would appear that few, if any, previous research findings have produced quite such support for a detailed and explicit verbal reception approach. In the case of initial learning or immediate recall (as measured by recall in Test 1), the results of this study—that explicit direction produces performances superior to those resulting from a guided discovery approach—are in general agreement with recent findings ; but similar findings for delayed retention and, more particularly, for transfer, were rather less expected on the basis of the relevant literature (Ausubel, 1963 ; Wittrock, 1963).

Within the framework of a schematic view of learning, it could be argued that during the initial learning period, subjects in the verbal reception group acquired a better organized and more comprehensive schema than did discovery subjects ; and that the superior performances of the verbal reception group in both delayed recall and application tests were due to this. The relatively slow, but steady, decline in performance on successive tests for this group could then be explained in terms of forgetting of some detail (for example, individual symbols or fragments of them), the overall structure still remaining so that, even after 10 weeks, sufficient of the basic schema remained for the group to have maintained their superiority over the guided discovery group. The poorer performances of the latter group can be interpreted within the same frame of reference : inadequate initial learning of the schema, possibly combined with some higher degree of rote learning, together resulting in more rapid forgetting and inferior ability to transfer the new learning.

But even if this rather speculative interpretation is accepted, the question could be asked : what enabled the verbal reception subjects initially to develop a better schema ?

At least two factors, both of which have already been mentioned in a different context, may contribute to a possible explanation—the imposed time limit on the experiment, and the learning history of the subjects.

Discovery learning, even guided discovery, requires that the student first discover and organize any new subject matter before internalisation in schematic form is possible. For verbal reception learning, however, the student has only a minimum of re-organization of the material before he can internalize the schema, provided that the material has been carefully structured to meet his requirements. There is another aspect to this situation too. Even in small interested groups, such as those used in this experiment, relatively few of the students voluntarily participate verbally in the discovery process. Finding out how many have followed the thought sequence leading to any particular discovery is a time-consuming process, the time required, and the difficulty of the task, increasing considerably as the number in the group increases. In a limited time situation the possibility exists, and is magnified by large classes, that an unknown number of students do not understand the basis of a discovery and, therefore, are in the worst possible type of verbal reception situation.

Without understanding, if they learn at all, these students can learn only by rote.

Earlier it was hypothesized that most subjects in both groups probably had histories of school and university learning based largely on verbal reception techniques. If this hypothesis is justified, it seems probable that, it, too, contributes to any explanation of why the verbal reception group proved superior to their colleagues instructed by the guided discovery method. However, this in no way detracts from the observation that the verbal reception technique can be a very efficient method of instruction, at least for those who can be assumed to have reached the stage of formal operations in Piaget's scheme of mental development.

There is one further result which requires special mention. This is the recovery of the guided discovery group relative to the verbal reception group on Application Test 3. In terms of absolute scores on this test, the guided discovery group actually improved. To suggest that the test was objectively easier than the first two tests could account for this absolute improvement; but it would not explain the *relative* improvement in comparison with verbal reception scores, which continued to decline absolutely. A possible explanation, following the above theoretical approach, is that the guided discovery group's improvement on Application Test 3 was due to a largely unconscious organization of hitherto inadequately and inefficiently structured material into a more meaningful and integrated schema.

This organization, it would follow, took place in the time period between Tests 2 and 3. To speculate further, it could be argued that Test 2 was of greater long-term significance for the guided discovery group than for the verbal reception group, in that for the former group it possibly 'triggered' the new, better structuring of the material, leading to improved performance on Test 3. The verbal reception group, it was suggested above, had already acquired a relatively meaningful schema as a result of its initial exposure to the material, so that its lower application score on Test 3 relative to Test 2 was due to the steady and continued forgetting of detail.

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VI.—APPENDIX.

LECTURE EXPLAINING THE SCHEMA AND SIMPLE SYMBOL COMBINATIONS

For learning to be meaningful to a person it is essential that what is to be learnt should be relateable to what is already known by that person. For example, it would be no use talking to you about the effects of reinforcement schedules on the permanence of learning if you did not already know the meaning of the terms reinforcement, schedule, and learning, as they are used by psychologists.

I am now going to show you the basic elements of a very artificial schema. It is a set of 17 symbols to which meanings have been attached. I want you to look through these now, and later, I want you to learn them, and learn how to use them to build up meaningful groups of symbols.

(At this stage one minute was allowed for the students to look at the basic elements of the schema.)

Now let me show you how to build up groups of symbols which are meaningful in terms of our basic schema. As in other languages, of course, precise translations are not possible. What you must do is to think of getting as close as possible in terms of the available symbols.

(The symbol groups and associated meanings were written on the blackboard as they were mentioned. In the examples below, the symbol group has not been reproduced : instead, an asterisk indicates that the appropriate symbol group was written on the blackboard.)

(1) In our schema a vehicle can be symbolised by * (square), it is a moving container. Note that no distinction is made in our language between * and * and * (arrow below, above and after the square : see example B (i) in Fig. 1), when, as in this case, no ambiguity is introduced.

(2) An aeroplane is a container which moves through the air.*

(3) A river is moving water.*

(4) Teaching is moving knowledge.*

(5) A teacher is a man who moves knowledge.* Another way of connecting two or more symbols meaning a single thing, when they form part of a larger meaning, is by single brackets, e.g., teaching, *, in the concept of teacher, could be written * (see example B (ii) in Fig. 1).

(6) A towel is a cloth which dries.*

(7) A tent is a cloth container.*

(8) A loom is an apparatus for making cloth.*

(9) Speech is moving words.*

(10) A letter is moving writing.*

(11) A book is words of knowledge.*

(12) A library is a place where there are many books.*

(13) An electric fire is electrical apparatus for making heat.*

(14) An aeroplane spotter is a man who sees aeroplanes.*

THE DEVELOPMENT OF A CONCEPT OF WEIGHT CONSERVATION IN E.S.N. CHILDREN

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Summary. 44 children from an ESN school were pre-tested on Piaget-type tasks involving conservation of weight. From these, two matched groups, each of six children (age 13 to 15, mental age 7 to 11) who consistently gave non-conservation responses, were selected. One group was given an individual teaching session of 15 to 30 minutes involving various tasks, manipulations and explanations. Post-tested after two and four weeks, all six showed consistent conservation of weight, whereas none of the controls did so. The six controls were then given comparable teaching, with similar positive results. Eight months later, 11 of the 12 children were re-tested and showed consistent conservation of weight. Results suggested that what they had learned about weight was readily generalised to volume.

I.—Introduction.

This inquiry was addressed to the following question. Given educationally subnormal children who show no evidence of having a concept of weight conservation, is it possible to teach them this concept and, if so, how can the teaching best be done? An answer to this question is important on both practical and theoretical grounds. On the practical side, many ESN children complete their schooling without having developed a concept of weight conservation and they may, thereby, be at a disadvantage in various everyday activities such as shopping, cooking, and working with materials in bulk. On the theoretical side conservation is a logical operation central in Piaget's theory of cognitive development : the attainment of ability to conserve is seen as a landmark in the development of logical thought which is free from perceptual domination. By attempting to teach a concept of conservation to slow-learning children it was hoped to discover if and how it is possible to modify or accelerate the acquisition of a logical structure.

Following Piaget (e.g., Piaget and Inhelder, 1941, Chapt. 2, especially p. 57), a child can be said to have a concept of weight conservation if he recognises that the weight of an object remains unchanged during changes in form so long as nothing is added or taken away : a pound of flour remains a pound whether it is in a bag or tipped into a bowl or spread over a bread board. Piaget regards the concept of conservation as central to the concept of weight ; thus no 'true' concept of weight is present until the judgment of weight is independent of changes in appearance, until weight is recognised as constant throughout changes in shape. However, a distinction can be made between a concept of weight and a concept of conservation of weight ; and this distinction seems important in teaching ESN children. Conservation can be regarded as a separate mental process because a perceptually based concept of weight and a consistent understanding of weight terms develop before a concept of conservation of weight. It would seem, therefore, that before introducing the complexity of conservation of weight, a teacher ought to treat weight independently, developing kinesthetic judgments of weight, an awareness of their limitations, and a concept of weight as distinct from substance. A concept of conservation of weight, essential to a 'true' concept of weight, can only develop when weight is experienced and distinguished from perceptual appearance.

Research has been carried out which attempts to advance conservation concepts in normal children using various different training procedures (see, for example, Smedslund, 1961a, b, c, and d ; Wohlwill and Lowe, 1962 ; Beilin, 1965). Generally, as Flavell (1963, p. 377) and Almy (1966, p. 42) have pointed out, such studies have had little success. Among training studies, relatively few have been concerned with the concept of *weight* conservation ; the majority have dealt with conservation of number or substance. However, Smedslund (*op. cit.*) carried out several experiments attempting to teach conservation of weight. The results were essentially negative. Although in some cases subjects learned to give conservation of weight answers, they gave up their acquired conservation, where ' natural ' conservers did not, when the experimenter surreptitiously removed a piece of plasticine as he changed an object's shape. Apart from Smedslund's studies, there have been a few other attempts to teach a concept of weight conservation. Kingsley and Hall (1967) reported success in teaching weight conservation by experimentally " training conservation through the use of learning sets " and Smith (1968) reported successfully teaching a concept of weight conservation by using a " verbal rule instruction " method.

As far as the writer knows, no experiments have been carried out on the teaching of conservation of weight to educationally subnormal children. The present study attempted to teach this concept to such children in order to clarify elements important in the development of the concept and to discover how to further the acquisition of such concepts by slow-learning children.

II.—PROCEDURE AND RESULTS.

Subjects were drawn from a school for educationally subnormal children. 44 children aged between 13 and 16 with IQs between 42 and 79 were pre-tested for conservation of weight judgments in the usual Piaget-type situations. 12 children, who gave non-conservation judgments on *all* the questions of the pre-test, were selected for special study. Six experimental subjects were matched as closely as possible by six control subjects with respect to chronological age and IQ. Between matched subjects, the difference in age was never more than six months, in IQ never more than five points. Children of higher and lower IQ, and higher and lower chronological age, were included for teaching. The six experimental group subjects were taught and then post-tested twice. When the experimental group were given the post-test for a second time, the six control group subjects were re-pre-tested ; then they too were taught and post-tested twice. Eight months later, 11 of the 12 original subjects were followed up and further tested.

The materials used were simple and familiar for the children : plasticine, book, pencil, model car, feather, apples, margarine, ' Lego ' blocks, balloons, lead ball, rice, rubber, plastic cups, boxes, chocolate, cheese, a two-pan balance, wooden and metal 1 cm. unit cubes, clear perspex containers, and water.

Throughout the entire investigation the experimenter was aware of the need to avoid giving children any extraneous or inadvertent clues by gesture, expression, or tone of voice and every attempt was made to avoid giving such clues.

(i) *Pre-testing.*

After an initial clarification that the children would be able to understand the questions as they were intended, that they could correctly use weight terms in relation to both concretely handled and verbally cited common objects, the experimenter introduced Piaget's conservation of weight situations (e.g., Piaget and Inhelder, 1941, Chapt. 2). The children were asked to make judgments for four transformations of plasticine. One of a pair of plasticine balls, previously recognised as of equal weight, was cut into halves or quarters or made into a snake or disc and the subjects were asked each time if the transformed pieces of plasticine still weighed the same.

Throughout the pre-test the experimenter made all the transformations in full view of the children. After a subject made a judgment, the experimenter made only non-committal remarks and, in an unchallenging manner, asked the child why he thought as he did. The same wording was used in all cases when asking the initial questions of conservation. However, in trying to discover the children's reasons for their judgments, the procedure was, of necessity, more flexible; children who had difficulty in expressing or finding reasons for their judgments were drawn out with questions unbiased but adapted to the child and situation.

Each subject was seen alone for about 10 minutes and sat opposite the experimenter at a small table in a quiet room of the school. The subject's performance on the pre-test was recorded on a standard form and, as far as possible, the child's exact comments were taken down.

The criterion for consistent non-conservation was a failure to recognise equality of weight after *every* transformation while also giving a clear indication of which portion was considered heavier and for what reason. Failure to recognise conservation of weight was exhibited in a variety of ways. In most cases the ball uncut, unrolled or unflattened was considered heavier, but in a few cases the changed portion was judged of greater weight; in several cases children were inconsistent and judged first the ball but later the transformed portion as heavier. In every case it was clear that the subject realised that all the pieces of the transformed ball were included for comparison yet still did not recognise equality of weight.

Of the 44 ESN children pre-tested, 16 were consistent non-conservers, 6 were conservers in some situations only, 21 were consistent conservers, and one child was too disturbed to be satisfactorily assessed.

(ii) *Teaching the Experimental Group.*

Six experimental group subjects (five boys and one girl whose respective ages and IQs were: 13 : 6, 72; 13 : 8, 60; 13 : 7, 77; 15 : 9, 66; 15 : 0, 74; and 15 : 7, 59), were matched with six control group subjects (three boys and three girls whose respective ages and IQs were: 13 : 10 ,76; 13 : 6, 58; 13 : 7, 76; 15 : 0, 61; 15 : 6, 72; and 15 : 11, 61). The six experimental group subjects were given training designed to develop the concept of weight conservation. Each subject was taught alone for one session of 15 to 30 minutes. Although the method of teaching was flexible and was adapted to the individual child, it was kept within standard limits and included standard manipulations, demonstrations, and explanations. Because the primary aim was to see whether a concept of weight conservation could be taught to ESN children, varied experiences were given: it seemed premature to opt for a particular method.

Each teaching session involved a sequence of eight steps (see appendix). These entailed handling unequal weights, equalising weights of materials, experiencing the distinction between size and weight, manipulating transformations of discontinuous and continuous materials, predicting and observing demonstrations of conservation. A combination of active manipulation and verbal representation was used throughout. Experiences were discussed and clarified. A variety of methods and materials was used since it was thought that different children might learn the same concept in different ways and that generalisation would be more likely to develop if varied experience were given. The importance of actual addition or subtraction of material for any change in weight was brought out in several steps ; identity likewise was emphasised in several situations. The need for an external measure was also pointed out in order to free children from misleading perceptual appearances ; a balance scale was introduced as an elementary measure of weight not necessitating transitivity.

By the end of the teaching session every subject recognised conservation of weight.

(iii) *Post-testing.*

The first post-test was given to each subject two weeks after teaching, and the second post-test, two weeks after that. Each subject was seen alone for about 10 minutes. The standard procedure was similar to that of the pre-test but included some new materials and situations to test whether a general concept had been developed rather than a specific response learned. Questions demanding inequality judgments, as well as questions on new materials such as chocolate and cheese, were included to reveal whether there was, for reasons other than that of a genuine concept of conservation, any agreement to sameness after transformation. Subjects were required to give simple judgments of inequality and also judgments of conservation of inequality of weight. Throughout, subjects were asked to give reasons for their judgments and a record was kept for each child.

On their first and second post-tests, all six experimental group subjects made conservation of weight judgments throughout on the familiar, unfamiliar, and inequality transformations. The reason usually given for conservation was that of identity in the sense that " it is still the same " plasticine, chocolate or cheese ; in two cases reversibility was the reason given, e.g., " you can make it back again."

On the repeat pre-test, given to the control group when the experimental group subjects did their second post-test, all six control subjects consistently gave non-conservation judgments.

(iv) *Teaching and Post-testing the Control Group.*

The control subjects were then taught in exactly the same way as the experimental group had been. Again, by the end of the teaching session every subject recognised conservation of weight.

On their first and second post-tests, carried out exactly as the experimental group post-tests had been, all six control subjects gave conservation of weight judgments throughout on the familiar, unfamiliar, and inequality transformations. For their conservation judgments, three control group subjects gave the reason of identity in the sense of " it is still the same material " and three gave the reason that " nothing has been taken away," a version of the identity reason.

(v) *Retention Study.*

In the retention study, carried out eight months later, the 11 available subjects were again given the post-test for weight conservation. Then, in order to see if the retained concept of conservation would be generalised further, the subjects were tested for conservation of volume by means of the situations Piaget has used to study interior and occupied volume (e.g., Piaget, 1960, Chapt. 14).

To ensure that subjects distinguished questions of volume from weight, the experimental situations and the wording of the questions were different for the two attributes and, where possible, judgment on the basis of the different attributes was made mutually exclusive—the separation of volume from weight was made by weighting plasticine balls. In addition, after the subjects had been asked questions of weight conservation, an operational distinction of simple volume and weight was required of them. For example, when lighter-bigger or heavier-littler objects were presented, subjects were asked to choose the heavier or lighter of the two objects and then the one which took less or more space. After the subjects made the distinction between weight and volume, they were given the conservation of volume problems. Piaget's interior volume situations were introduced first. Three transformations of one of a pair of 36-wooden-unit-cube buildings, previously recognised as of equal volume, were made; and the subjects were asked whether the buildings still had as much room in them. Next, the occupied volume situations were presented using both discontinuous (36 metal unit cubes) and continuous (plasticine) material. After recognitions of equality followed by transformations, the subjects were asked whether the objects still would take up equally much space in the containers of water. For the conservation of volume situations, as for the weight post-test situations, each subject's judgments and reasons for them were recorded.

The 11 subjects available for the retention study still gave correct conservation of weight judgments with appropriate reasons for them. These 11 subjects, as well as making conservation of weight judgments, made conservation judgments in the Piaget volume situations. Individual subjects gave the same reasons for conservation in the volume situations as they had given for conservation of weight. Some of the children who in the weight situations stated that nothing had been added or subtracted, in the conservation of volume situations gave, in addition, conservation of number reasons. Children who gave the reason of sameness of material gave only that reason throughout.

III.—DISCUSSION.

The experiment showed that it is possible to teach a concept of conservation of weight to previously consistently non-conserving ESN children. After a single teaching session, all 12 subjects gave conservation of weight judgments which were durable as well as generalised and supported by reasons. It can, therefore, be argued that a genuine concept of conservation had been taught. It might, however, be suggested that the subjects had learned only a verbal response. For example, the words " if I do this to mine . . . ? " might be said to be a cue for ' yes ' answers, and judgments of sameness for reasons of identity. There are four grounds for rejecting such an interpretation :

(1) In the conservation of weight post-test situations, subjects were required to give negative as well as positive judgments, i.e., judgments of inequality as well as equality. They did this correctly.

(2) The reasons the children gave were not as similar as the classification into categories might suggest. For example, the " nothing has been added or taken away " category includes reasons such as " you haven't took none off it," *or* " you haven't put nothing to it," *or* " you still got all the pieces "—not a single taught verbal response. In the " same stuff " category, additional comments, such as " you just put it different," indicated more than verbal learning.

(3) As the reason of identity was only one of several reasons brought out in the teaching situations and was not a practised response, and as varied active experience of conservation of weight was given, it would seem unlikely that a simple verbal response alone was learned.

(4) In the retention study, very different expressions followed the " if I do this to mine... ? " opening in the volume and weight situations. Although it is true that, in the weight situations, the wording was always the same (" Will your share and my share still weigh the same, still be equally heavy? "), in the volume situations questions on interior and occupied volume were worded entirely differently and the " if I do this to mine . . . ? " was a very distant cue indeed. There is, therefore, evidence that more than a verbal response had been learned.

No attempt was made to ' extinguish ' conservation responses by surreptitiously removing material because it seemed unfair to subject retarded children to such a situation. The fact that both Kingsley and Hall (1967) and Smith (1968), on the basis of their experimental results, reject resistance to extinction as a means of distinguishing ' taught ' from ' genuine ' conservation lends support to the omission of this as a test for the genuineness of the conservation taught in the present experiment.

Experience during the eight months after the teaching session might have resulted in the development of conservation of volume independent of the teaching of conservation of weight and so it cannot be stated conclusively that the taught conservation of weight is generalised to volume, although such generalisation is suggested by this study. Although it is unlikely that a concept of conservation in both volume situations would have been shown when conservation of weight in the pre-test situations was not, and although it was reported that conservation of volume had not been taught during the eight months, both of these factors need to be controlled before generalisation of taught conservation can be said definitely to occur.

Although this experiment, and an earlier one carried out by the writer on the conservation of substance, showed that it is possible to teach ESN children a concept of conservation and how, in general, one can accelerate such a concept, further work is needed to determine the specific effective and essential factors in the teaching as well as the extent of the influence of the teaching. Such points are currently being investigated by the writer but, on the question of the effective and essential elements, it is the writer's impression from working with the children that more than one particular experience or explanation is responsible for the development of a concept of weight conservation. Piaget (1968) writes that conservation involves more than identity alone and depends on a total system of operations involving reversibility and compensation as well as identity. Piaget further argues that ' quantitative operational ' identity, i.e., identity in the sense of " nothing has been added or subtracted," rather than ' qualitative pre-operational ' identity, i.e., identity in the sense of " same material," is necessary for the development of conservation. He sees this ' quantitative identity operation $+0-0=0$,' as a necessary yet not sufficient foundation for conservation. In short, Piaget argues that the system of operations which is essential for the development of conservation includes this ' quantitative ' identity and also reversibility and compensation. Although subjects in this experiment gave ' qualitative ' identity reasons alone, as well as ' quantitative ' identity reasons alone, in explanation of conservation, it cannot be said conclusively that identity alone provided sufficient basis for conservation. Subjects may have been aware of compensation and/or reversibility as well as identity even though they cited only identity explicitly in giving reasons for conservation judgments; ESN children lacking verbal fluency are unlikely to express more than a single reason for their judgments.

To conclude: the results of this experiment show that it is possible to develop a concept of weight conservation in ESN children using a teaching method which includes active manipulations by the learner and verbal representations with emphasis on identity, subtraction/addition, and reversibility.

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V.—APPENDIX: TEACHING PROCEDURE.

Step 1. S experienced, with eyes closed, the muscular feel of objects of different relative weight and gave judgments of heavier or lighter for two plasticine balls, and then, for a book and a rubber.

Step 2. S was asked to equalise the weight of two initially unequal plasticine balls, and then, unequal amounts of rice in two identical plastic cups. E pointed out the need of a balance for accuracy, and, where necessary, how to use a balance

Step 3. S tried on the balance large-light and small-heavy objects and then, objects of identical appearance but different content and weight. E emphasised the distinction between weight and size and that judgment could not be made by appearance only.

Step 4. S balanced two four-piece ' Lego ' cubes ; then broke one into halves and balanced it against the whole cube ; then further broke it into quarters and balanced it. S then put the broken cube back together again and repeated the procedure while E counted the pieces of ' Lego ' to bring out the continuing equality.

Step 5. S manipulated reversibility of continuous material, i.e., cut a whole ball of plasticine into halves and then quarters, put them back together, and did this several times balancing the portions throughout while E emphasised that the weight was unchanged

Step 6. S carried out continuous transformations of plasticine, i.e., turned one ball from snake to ring to disc and back again to ball while E stressed the identity of the plasticine.

Step 7. S was asked to predict whether changing the shape of one of two plasticine strips would change the balancing of the two strips, and then, whether cutting would change the balancing weight of a block of margarine, and last, the same for two balanced apples if one were cut.

Step 8. Finally, E used Smedslund's (1961e) method of inducing conservation by creating ' cognitive conflict ' After two balls of plasticine were recognised as of equal weight by S, one was rolled out into a snake : If S judged one portion to be heavier, E ' subtracted ' a small piece of plasticine, asked S if the ball and the snake were then of equal weight or not, and if not, which S thought was heavier, and emphasised that some plasticine had been taken away from one of the previously equal portions so that, even if it appeared heavier, it was not heavier if some plasticine had been taken away from it. S was, therefore, faced with a portion still perhaps perceptually larger but emphasised as containing less plasticine. Then the piece was put back on, equalising the weights of plasticine. Next, after S agreed that two balls were of equal weight, one was flattened into a disc and a small extra piece of plasticine was added to whichever portion S judged lighter. This again was meant to create ' cognitive conflict ' if the one that still appeared lighter obviously had been given more plasticine. The extra piece was then taken away and the portions emphasised as of equal weight A form of Smedslund's (1962) subtraction /addition process was carried out even if S judged the ball and snake, or ball and disc, to be equal first

THE PERCEPTION OF INTERPERSONAL RELATIONSHIPS DURING ADOLESCENCE

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SUMMARY. The study is concerned with the development of the perception of interpersonal relationships in grammar school boys. The responses of three different age groups to a relatively new projective test specifically oriented towards interpersonal relationships are compared, and the results indicate that during adolescence major changes occur in the perception of solitude, two-person, three-person and group situations. Although many of the changes are consistent with present theory, it is noted that a considerable proportion of the evidence relates either to controversial issues in adolescent development or to areas which have received little attention in the past.

I.—INTRODUCTION.

THE field of adolescent development contains a number of areas which have so far remained largely in the realm of speculation, and it seems probable that one of the major factors which has inhibited research in these areas has been the difficulty in finding appropriate methods of study. Nowhere is this more true than in the exploration of interpersonal relationships, where most relevant empirical evidence has tended either to deal with somewhat peripheral issues—for example the work on self-image during adolescence (Carlson, 1965 ; Katz and Zigler, 1967)—or to be limited to one age group, and therefore not in any real sense developmental—for example Hallworth and Waite's (1966) study of the value judgments of adolescents.

The only studies which have made a direct attempt to explore interpersonal relationships have been those of Meissner (1965) and Douvan and Adelson (1966), whose method has been that of the 'direct question.' While such a method provides valuable data, it does have severe limitations, not only because the adolescent may be unwilling to answer direct questions concerning his relationships, but also, and more important, because it seems likely that he will be unaware of the fundamental attitudes and tendencies which govern most of his interpersonal behaviour.

In two previous studies (Coleman, 1968 ; 1969) it has been argued that projective tests can be used to provide a method for studying the development of interpersonal relationships which has the advantage of eliciting material which could not be obtained either by direct questioning or by observation. Both studies were limited in terms of subjects and design, and were no more than preliminary attempts to use projective material in this way, but the results were encouraging, and thus further studies have been planned. The present one describes work with a wider age range and involves the use of a relatively new projective test which focuses specifically on inter-personal relationships.

II.—METHOD.

Subjects.

The subjects were a total of 74 adolescent boys from a grammar school in the East Sussex area. They were drawn from three age groups—12-year-olds who were in their first year in the school (N=25), 14-year-olds who were in their third-year in the school (N=29), and 17-year-olds who were in their sixth year in the school (N=20). The mean ages of the groups were 12 years 3 months, 14 years 2 months, and 17 years 5 months. The groups were matched as closely as possible for academic performance, all subjects being in the top sets for Arts subjects.

Procedure.

Eight cards of the Object Relations Technique (Phillipson, 1955) were used. This is a projective test based on similar principles to the more familiar TAT or Thematic Apperception Test. Two ORT cards from each of the following interpersonal situations were chosen for use in the present study: One-Person situation (A1, B1), Two-Person situation (B2, C2), Three-Person situation (A3, B3), and Group situation (BG, CG). In his book Phillipson (1955) describes these cards as follows:

> A1—" In the middle foreground one upright human figure in silhouette, in slightly darker shading than the rest of the picture."
>
> B1—" Interior of a room . . . In the doorway in dark and definite silhouette is a human figure . . . and the shape of railings suggesting a staircase. To the left of the door is sketched a chest of drawers. In the bottom left-hand corner is the end of a bed."
>
> B2—" Exterior situation. House in mid-distance on the left. Silhouette of two figures very close together under a tall tree in foreground on the right."
>
> C2—"A silhouette outside a doorway, through which is seen a part of the interior of a room, in which is the end of a bed. On the bed is a shape usually taken to be a second human figure."
>
> A3—" In middle distance on the right are silhouettes of two figures almost touching, the one on the left being slightly the taller. On the left of the picture is the third figure standing out slightly from light shading. Diagonally, from right to left, the shading gives an effect which is often interpreted as a road or stream separating the two figures from a third."
>
> B3—" Two merged silhouettes of human figures stand in the centre of the picture. Behind is an open door . . . towards the right of this doorway is a half silhouette of a third figure."
>
> BG—" Two arches in a structure which is broken in middle distance, and which stands beside a ' roadway ' . . . The structure is in dark shading and in the light areas of the two arches are silhouettes of human figures; in the archway nearer the left are five figures, and in the second archway one upright figure."
>
> CG—"A long stairway covering almost the whole of the picture. On the top in the left is the shadow of a human figure, and at the bottom towards the right corner a group from which are often distinguished three or four human figures, one of whom has an arm raised."

The pictures were projected on to a screen in the classroom, the instructions to each group being: " I'm going to show you some pictures, and I want you to write a story about each one. Try and say who the people are, what they're doing, and how it's going to end. For each story you'll have about five minutes."

Scoring.

In selecting the appropriate scoring categories it was necessary to consider not only the interpersonal situation (i.e., One-Person, Two-Person, etc.) but also the specific differences between one picture and another. Thus, for example, while there were two cards which portrayed a Group situation, one of these (BG) tends to elicit stories concerning the relationship between a group and a single person, while the other (CG) elicits stories the majority of which deal with group aggression. Thus scoring categories were chosen with three points in mind:

(1) Only those themes expressed by at least 20 per cent of any one age group were included.

(2) Any theme which was expressed directly as a result of the detail on a specific picture was included. For example, " People walking in the fog " on A3 arises as a result of the blurred shading on this card.

(3) The majority of themes, however, were chosen in terms of their relevance to interpersonal relationships. For example, on card BG themes were scored which concerned the relationship between a group and a single person: (*a*) the group depends on the individual, (*b*) the group rejects the individual, (*c*) the individual separates himself from the group. This is not to imply that these are the only possible themes which might arise, but they were the three major themes expressed by this sample of adolescent boys.

Two psychologists independently scored 30 of the 74 records and interjudge reliability scores were derived for each of the 26 scoring categories. Agreement ranged from 60 per cent to 100 per cent, with a mean of 76·8 per cent.

III.—RESULTS.

The data consist of the proportions of each age group who express the selected themes on each of the cards. In order to illustrate the significance of the differences between these proportions *chi square* has been used, with the Yates correction for continuity being applied in all cases. In Tables 1–4 these proportions are expressed in the form of approximate percentages. In view of the numbers involved it has been necessary to compare the proportion in one age group with the mean proportion of the other two combined. In the tables the age group which is bearing comparison with the other two is set in italics.

TABLE 1

THE PROPORTIONS OF EACH AGE GROUP WHO EXPRESS THE MAJOR THEMES ON THE ONE-PERSON CARDS.

	12 yrs. %	14 yrs. %	17 yrs. %	chi square	p
A1					
Person alone, lonely, isolated	*28*	3	6	6·383	< ·02
Person waiting for someone	16	*21*	11	0·184	N.S.
Person thinking deeply about problems	4	14	*44*	9·038	< ·01
B1					
Person alone, coming to bed	52	38	*11*	5·159	< ·05
Murder or burglary	*36*	24	28	0·442	N.S.
Promiscuous or extra-marital sex ..	0	3	*39*	15·930	< ·01

N.B.—In all cases comparisons are between the age group which is in italics and the mean of the other two age groups combined.

In Table 1 the results which concern the One-Person cards are set out. While on card A1 there are no differences between the age groups with respect to the theme of waiting for a second figure, the 12-year-olds express significantly more themes which simply state the fact of their loneliness, while the 17-year-olds express significantly more themes in which the individual uses his solitude to think constructively about his problems. On card B1 the 12 and 14-year-olds express significantly more themes than the 17-year-olds which concern the individual coming to bed alone, while the 17-year-olds express significantly more themes of promiscuous or extra-marital sexual relationships.

TABLE 2

THE PROPORTIONS OF EACH AGE GROUP WHO EXPRESS THE MAJOR THEMES ON THE TWO-PERSON CARDS

	12 yrs. %	14 yrs. %	17 yrs %	chi square	p
B2					
Young lovers, courting, engaged, will be married	*56*	28	11	7·488	< ·01
Two people use tree as shelter .	*28*	3	0	8·358	< ·01
Two young people talking, getting to know each other	0	*24*	6	6·179	< ·02
Young lovers opposed by adult world	0	7	*39*	12·130	< ·01
C2					
Murder	*36*	10	6	6·523	< ·02
People going to bed	*20*	34	29	0·314	N.S.
Caring for dying person	0	0	*24*	5·276	< ·05

In Table 2 the results from the Two-Person cards are set out. Three themes on card B2 illustrate a range of heterosexual inter-personal situations—a conventional development from courting to marriage, which is expressed significantly more by 12-year-olds, a social contact in which the emphasis is on mutual discovery, expressed significantly more by the 14-year-olds, and a relationship in which opposition from adults is a central feature, expressed significantly more by the 17-year-olds. In addition, on this card there is another perhaps more symbolic theme, that of people sheltering under a tree, which is expressed primarily by the 12-year-olds. On card C2 the 12-year-olds express significantly more murder themes than do the older boys, while the 17-year-olds express significantly more themes which involve caring for a dying person.

The results from the Three-Person cards are dealt with in Table 3. On card A3 the theme of conflict (in this case one member of the group against the other two) is expressed significantly more by the 14-year-olds than by the other groups, and the theme of co-operation between three people is expressed significantly more by the 17-year-olds.

On card B3 there are no significant differences between the groups for the theme of the child watching two older people in a heterosexual situation, but the 17-year-olds express a significantly greater number of themes in which a parent is anxious about or angry with a young couple, as well as expressing a significantly greater number of themes in which someone watches an adulterous relationship.

TABLE 3

The Proportions of Each Age Group Who Express the Major Themes on the Three-Person Cards.

	12 yrs. %	14 yrs. %	17 yrs. %	chi square	p
A3					
People walking or looking for their way in the fog	40	41	*33*	0·071	N.S.
One person in conflict with two others	4	*45*	6	14·640	<·01
Group of three in co-operative activity	8	0	*33*	9·933	<·01
B3					
Child watches adults or older sibs together	40	*44*	39	0·004	N.S.
Parent anxious about or angry with young couple	0	0	*24*	5·276	<·05
Someone watches adulterous relationship	0	3	*33*	11·384	<·01

The results in Table 4 deal with the two Group cards. On card BG there are three major themes expressed by this sample of adolescent boys: that in which the group is dependent on a guide or teacher, expressed significantly more by the 12-year-olds, that in which the group excludes or attacks an outsider, where there are no significant differences between the groups, and finally the theme in which the individual voluntarily withdraws from the group, expressed significantly more by the 14 and 17-year-olds than by the 12-year-olds. On card CG the 12-year-olds express significantly more themes concerning criminal and disruptive behaviour, as well as significantly more themes of panicky flight. In contrast to this the 14-year-olds express significantly more themes in which the group is engaged in some sporting activity, while the 17-year-olds express significantly more themes of protest or anger towards authority.

TABLE 4

The Proportions of Each Age Group Who Express the Major Themes on the Group Cards.

	12 yrs. %	14 yrs. %	17 yrs. %	chi square	p
BG					
Group led by guide or teacher	*36*	14	11	4·257	<·05
Individual voluntarily withdraws or separates from group	*0*	24	17	4·383	<·05
Group excludes or attacks outsider	20	*17*	22	0·007	N.S.
CG					
Group engaged in criminal or disruptive behaviour	*32*	7	6	6·326	<·02
Group flees in panic from fire, wild animals, etc.	*24*	0	0	9·170	<·01
Group engaged in swimming or other sport	8	*34*	11	5·502	<·05
Group expresses anger or protest to authority (emperor, mayor, P.M.)	4	14	*33*	4·213	<·05

IV.—Discussion.

A number of differences between age groups are illustrated by the above results. In broad outline these are, firstly, that the 17-year-olds appear more able to make use of solitude, for they are the only group who perceive it as a time during which people think deeply about problems. Secondly, the evidence suggests a development in the perception of the nature of a heterosexual relationship, for while the 12-year-olds express themes of conventional progress from courting to marriage, the 14-year-olds stress the social and exploratory nature of the relationship, and the 17-year-olds concentrate on the external problems involved, especially with reference to adult opposition. Thus, the development appears to involve an increasing awareness of the real nature of relationships, as well as a change in emphasis regarding the problems of such a relationship—for the 14-year-olds the difficulties lie within the relationship itself, while for the 17-year-old they lie with the environment.

A third difference between the groups relates to their perception of interaction in a Three-Person situation, a situation which reflects the primary family triad. Here themes of conflict are expressed by the 14-year-olds, while the 17-year-olds express themes of co-operation. Again the difference appears to illustrate a development in the adolescent's interpersonal world from a perception of the Three-Person situation as conflicting and divisive to one in which a group of three is likely to be more positive and constructive in its interaction.

Consideration should also be given to the changes in themes concerning the relationship between the individual and the group. Here it seems that while the older children—both the 14 and 17-year-olds—perceive situations in which people retain their individuality in relation to the group, and are able to withdraw or separate themselves from it, the 12-year-olds do not perceive the situation in this way, but rather in terms of an undifferentiated group in a dependent relationship with an authority figure. The greater dependence of the 12-year-olds is further illustrated by the fact that this group expresses a significantly greater number of themes concerning the use of the tree as shelter on card B2, a theme which is hardly expressed at all by either of the two older groups.

Finally, there are interesting differences between age levels with regard to the theme of group aggression, and here again the evidence appears to illustrate a development from one age group to the next. Among the 12-year-olds there is a preponderance of themes either of primitive uncontrolled aggression or of panic because of some impersonal destructive force (wild animals, fire, etc.) while the 14-year-olds express themes of conventional sporting activity, and the 17-year-olds of aggression which is directed towards authority figures, often within a social framework of protest. Thus there appear to be considerable changes in the perception of group aggression, with a development from the primitive, disorganised or projected aggression to a sublimated expression in the form of sport, and from this to a relatively more organised expression with elements of direction and control.

One of the fundamental questions regarding this type of material is the question of the validity of the method. What do the basic data, fantasies in response to a specific stimulus, represent? On the one hand there is the issue of whether the material reflects tendencies to overt behaviour or a covert level of the personality unrelated to action. On the other hand the question arises as to whether the differences between age groups are a function of internal developmental changes or of the changing external pressures and circumstances surrounding the individual. With respect to the first question, while there is an ever-growing literature on the relation between fantasy and behaviour (for reviews see Murstein, 1963; Haley, Draguns and Phillips, 1967) the problem is far from being resolved. Recent evidence suggests that the answer depends on a large number of variables such as the anxiety of the subjects (Lesser, 1958), the type of subject (Weissman, 1964), the tests used (Coleman, 1967) and so on. It has to be admitted that the stage has not yet been reached where it is possible to say with any certainty whether material elicited by projective tests reflects overt or covert levels of the personality, or indeed whether it is possible to make such a distinction at all.

For the purpose of the present research it is perhaps not as essential to answer this question as it is to answer the second one, concerning the reasons which underlie the differences between the age groups; it could be argued that these differences have very little to do with the development of interpersonal relationships but simply reflect the external surroundings of the boy or girl. If this were so, the results might provide information about the social environment of the children, but would be of no value in the exploration of adolescent personality development. In point of fact this argument has little substance, for internal development and the environment interact with one another so that in the behaviour of the individual the influence of the one cannot be separated from the influence of the other. This can be illustrated by some of the above results. It will be recalled that in the perception of a heterosexual relationship between the two people the 12-year-olds express themes of conventional courting and marriage, the 14-year-olds of getting to know the other person socially, and the 17-year-olds of opposition from the adult world. It is probable that the 14 and 17-year-olds choose these themes because they represent the circumstances in which they and their friends find themselves. Yet they find themselves in these circumstances precisely because personality develops from one age level to the next. The internal and external are essentially part of the same process, each acting and reacting with one another, so that it cannot be argued that the present material tells less about internal factors than about external ones, for both play equal roles.

Finally, what are the implications of the above results? On the whole they appear to be consistent with any general theoretical outline of adolescent development (e.g., Mussen, Conger and Kagan, 1963) with regard to notions of maturity, individuation, greater control of impulses and so on. If the results support what is already known, this in itself is not insignificant, yet in fact they do more than this. Firstly, some of the material provides a starting point for the resolution of important theoretical issues. For example, there has been some discussion (Blos, 1962; Blum, 1963) of a disagreement in the literature between those theorists such as Deutsch and Sullivan who consider pre-adolescence to be the time of greatest freedom from aggressive and sexual impulses, and those who argue precisely the opposite, such as Anna Freud, Spiegel and Blos himself. Now, in the present results themes of primitive aggressive impulses, particularly those expressed in group situations, are most common among the 12-year-olds, while the 14-year-olds express themes of sporting activity. Clearly this result lends support to the view that a breakthrough of impulses does come at the pre-adolescent stage, those who are already adolescent being more likely to express such impulses in a defended, sublimated form. A further similar example is the controversial issue of conflict between adolescent and parents mentioned by Blum (1963) and Veness (1966). Here the question revolves not only around the time at which this conflict occurs, but also involves a query by some writers as to whether this conflict is as important as has previously been assumed (Douvan and Adelson, 1966). Again the present results cast some light on the issue in view of the fact that themes of conflict in the Three-Person situation are hardly expressed at all by the 12 or 17-year-olds but are expressed by a very considerable number of the 14-year-olds. This suggests not only that conflict in a triad is a central issue for the 14-year-olds, but also that such conflict has its greatest occurrence at a specific stage rather than being a general phenomenon of adolescence.

Secondly, the above results touch on areas which are of very great importance for the understanding of adolescent development, yet which have so far received little attention. Examples are the development of the adolescent's attitude to solitude, his individuality in relation to a large group—also broached in the interesting work of Adelson and O'Neill (1966) on the development of political concepts during adolescence—and the difference in his behaviour in various interpersonal situations. All these are areas for future research which have only been hinted at in the present study. They require further exploration using not only a greater range of subjects in terms of age, social class and so on, but also corroborative material from other types of test. Nonetheless, the study has shown that fantasy material derived from projective tests can play a significant part in the study of normal development, not only in confirming theory, but also in helping to resolve controversial issues as well as in providing a stimulus to further research.

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THE RELATIONSHIP OF CREATIVITY AND INTELLIGENCE IN IRISH ADOLESCENTS

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SUMMARY. Kogan and Wallach have argued that the separate subtests of the Minnesota Tests of Creative Thinking probably share no more variance in common with each other than that which they also share with general intelligence. Madaus found only partial support for this hypothesis with an American high school sample. This study tests the hypothesis using a sample of Irish public grammar school pupils; the results of this study are virtually the same as those found by Madaus. Two possible explanations for this similarity of findings across cultures are offered.

I.—INTRODUCTION.

IN his presidential address to the American Psychological Association, Guilford (1950) called attention to the neglect of the concept of creativity and predicted that the relation between intelligence and creativity would be low. In a generative investigation of this question, Getzels and Jackson (1962) found positive but low correlations between measures of divergent thinking and intelligence, a finding which has been replicated (e.g., Torrance, 1962; Hudson, 1966; Madaus, 1967b). In their review of the literature, Taylor and Holland (1962) concluded that the greater number of investigations report a positive but low correlation between the two constructs (·20—·40) for general populations and almost no correlation at the higher ability levels. Allen, Dacey and Madaus (1969) studied the relationship at three levels of IQ in three diverse populations, and found the highest of the nine correlations to be ·17.

However, Hasan and Butcher (1966) found a much higher correlation (·74) between the two constructs for Scottish children, and Ginsberg and Whittemore (1968) report a correlation of ·60 for an Australian sample. We would hypothesize that these higher correlations may be the result of an interaction between methods factors relating to both measures rather than to a high relationship between the two traits; (Allen, Dacey and Madaus, 1969; Getzels and Madaus, in press; Madaus, 1967 a and b).

Some of the above studies have been criticised on technical grounds (e.g., Ripple and May, 1962; Marsh, 1966; McNemar, 1964), but an even more pertinent question has been raised by both Burt (1962) and Thorndike (1963) concerning the underlying dimension tapped by measures of divergent thinking. They point out in their reviews of selected studies that while the relationship between the divergent thinking measures and IQ is low, the correlations between the various divergent thinking tests themselves are often of the same magnitude. Wallach and Kogan (1965), after an extensive review, also concluded that divergent thinking tests in general use were not measuring an attribute distinct from general intelligence. They then proceeded to build five new divergent thinking tests based on a conceptualization of creativity similar to Mednick's (1962). They administered these tests with no time constraint and in a game-like atmosphere to a group of fifth graders. Wallach and Kogan's scoring procedures, which resulted in scores for uniqueness and number of responses, closely resemble procedures used by Guilford and Torrance for deriving originality and fluency scores. Correlating the results with measures of intelligence, they concluded that their construct of creativity possessed an internal consistency and comprehensiveness similar to that possessed by the general intelligence domain while being substantially independent of that domain. An oblique factorization of the Wallach and Kogan data led Ward (1967) to conclude that the results tend to support Wallach and Kogan's choice of procedures, but also demonstrated the multifactorial nature of creativity. In an unpublished factor analysis (employing a varimax rotation) of the Wallach and Kogan correlation matrix, the present authors produced results virtually the same as those of Ward.

Wallach and Kogan also argued that, unlike the interrelationship found between their subtests, the separate subtests of the widely used Minnesota Tests of Creative Thinking (1964) probably share no more variance in common with each other than that which they also share with general intelligence. Madaus (1967b) tested Wallach and Kogan's hypothesis with an American high school sample. He found, for the Minnesota tests, a correlation matrix that closely resembled Wallach and Kogan's, an apparent contradiction to their hypothesis. There was a clear independence between the divergent thinking and intelligence indices. Unlike Wallach and Kogan's battery, Madaus found task-specific measures of selected tests of the Minnesota battery highly interrelated within both the verbal and non-verbal creativity batteries. However, measures with the same construct name (e.g., fluency, orginality) had low correlation across the verbal and non-verbal batteries, which does lend partial support to Wallach and Kogan's position.

The purpose of the present study was to replicate the Madaus study in another culture with the use of the same creativity tests, but different intelligence measures, in order to determine whether his findings are independent of cultural differences.

II.—METHOD.

The sample consisted of 182 Irish secondary pupils from suburban Dublin. The boys were enrolled in a boys' school staffed by a religious order of men, the girls in a girls' school staffed by a religious order of women. Their median age was 14 : 8 years ; both schools are considered neighbourhood schools serving white collar, middle-class families with a few families of skilled workers.

The divergent thinking measures, administered under a timed condition in a group setting, were the following four subtests of the Minnesota Tests of Creative Thinking (Yamamoto, 1964) :

Verbal.

Product Improvement : The subject was asked to list changes in a toy that would result in children having more fun playing with it.

Unusual Uses : The subject was asked to list unusual uses for a toy other than as a plaything.

Non-Verbal.

Figure Completion : The subject was asked to add lines to an incomplete figure to make an object or design.

Circles : The subject was asked to make objects from 30 circles.

Procedures used to score these tests are detailed in Madaus (1967b).

Psychological testing is not practised in Irish schools. In fact, achievement tests are of the essay rather than of the objective type. Since there is no intelligence test designed specifically for the Irish population, it was decided to use the AH4 Group Test of Intelligence (undated). (The AH4 was decided upon after consultation with the staff of the Educational Research Centre, St. Patrick's College, Dublin. An intelligence test for an Irish population is currently being standardized.) Since the total score on AH4 is not adjusted for chronological age, age was included as a variable. Furthermore, since the age of the respondents varied from 13 to 16, it was considered necessary to examine the relationship between age and the various measures of divergent thinking. The reason for this range in ages is due to the option in Ireland of beginning school at age four, five or six. The semantic, figural and total scores of the AH4 were used in the analysis. The total score, being a linear composite of the two subtests, was excluded from the factor analysis.

III.—RESULTS.

Table 1 contains the means and standard deviations for the eight divergent thinking tests and of the two subtests and total score of the intelligence measure.

TABLE 1

MEANS AND STANDARD DEVIATIONS OF SCORES ON THE MINNESOTA TESTS OF DIVERGENT THINKING AND THE AH4 GROUP TEST OF GENERAL INTELLIGENCE.

Variables	Mean	s.d.
Non-Verbal Fluency	22·03	8·20
Non-Verbal Flexibility	11·99	3·90
Non-Verbal Originality	52·20	18·30
Non-Verbal Elaboration	28·58	9·21
Verbal Fluency	18·18	7·52
Verbal Flexibility	8·44	3·78
Verbal Originality	29·24	12·81
Verbal Elaboration	20·64	8·37
Intelligence : Semantic Section ..	31·48	7·27
Intelligence : Figural Section ...	35·05	9·24
Total Creativity	189·94	57·03
Total Intelligence	66·53	15·27

The relationships between the measures of divergent thinking and intelligence can be examined from the intercorrelations between the measures and from the results of a principal components factor analysis. Table 2 presents the intercorrelations between the 13 variables. Table 2 shows that the verbal divergent thinking tests are highly intercorrelated; the mean intercorrelation using Fisher's z transformation is ·75. The same picture is true for the non-verbal divergent thinking tests, the mean intercorrelation being ·82. This was not the case for the intercorrelations between the verbal and non-verbal divergent thinking measures, the mean intercorrelation being a relatively low ·39. The mean intercorrelation between the divergent thinking tests and intelligence is ·08. Thus, the task-specific measures are highly inter-related, almost to the point of being redundant. However, the measures with the same construct (e.g., Fluency) have low correlations across the verbal and non-verbal batteries. Age has very little relationship with either the divergent thinking or intelligence constructs.

TABLE 2

INTERCORRELATIONS BETWEEN SUBTESTS OF THE MINNESOTA TESTS OF DIVERGENT THINKING AND THE AH4 GROUP TESTS OF GENERAL INTELLIGENCE.

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Non-Verbal Fluency	1·00												
2. Non-Verbal Flexibility	·61	1·00											
3. Non-Verbal Originality	·76	·73	1·00										
4. Non-Verbal Elaboration	·69	·74	·87	1·00									
5. Verbal Fluency	·44	·34	·46	·53	1·00								
6. Verbal Flexibility	·24	·18	·30	·36	·68	1·00							
7. Verbal Originality	·43	·30	·39	·46	·91	·56	1·00						
8. Verbal Elaboration	·42	·33	·46	·53	·94	·63	·86	1·00					
9. Intelligence-Semantic Section (AH4)	–·09	–·08	–·01	·03	·09	·18	·05	·16	1·00				
10. Intelligence-Figural Section (AH4)	·01	·02	·09	·12	·13	·17	·08	·19	·71	1·00			
11. Total Divergent Thinking	·76	·66	·81	·83	·83	·54	·78	·82	·04	·13	1·00		
12. Total Intelligence (AH4)	–·03	–·03	·05	·09	·12	·19	·07	·20	·90	·94	·10	1·00	
13. Age	–·05	–·18	–·13	–·19	–·12	–·08	–·05	–·15	–·02	–·17	–·15	–·11	1·00

It is interesting to compare these results with the findings of Madaus (1967a) and Wallach and Kogan (1965). Madaus reported average intercorrelations between all the divergent thinking scores of ·43, Wallach and Kogan of ·40. In both cases these correlations are somewhat lower than the correlation between the two intelligence measures. On the other hand, in the Madaus study the average intercorrelation between the intelligence and divergent thinking measures is ·05; for Wallach and Kogan, it is ·10. There is much less redundancy between the various divergent thinking scores in the Wallach and Kogan matrix than in the matrices of this study or that reported by Madaus.

The independence between the divergent thinking tests and the intelligence measures can be seen more clearly from the results of the principal components analysis of the correlation matrix. Table 3 shows the four factors extracted from the original matrix whose roots are greater than one. A varimax rotation was performed and these factor loadings are also presented in Table 3.

TABLE 3

UNROTATED AND ROTATED FACTOR LOADINGS FOR SELECTED TESTS OF THE MINNESOTA TESTS OF CREATIVE THINKING AND THE AH4 GROUP TEST OF GENERAL INTELLIGENCE

	General Intelligence							
	Unrotated Factor Loadings				Rotated Factor Loadings			
	1	2	3	4	1	2	3	4
Non-Verbal Fluency	·73	–·40	·16	·19	·82	·24	–·06	·08
Non-Verbal Flexibility	·67	–·47	·32	–·01	·86	·10	–·05	–·13
Non-Verbal Originality	·79	–·39	·30	·11	·91	·22	·04	–·03
Non-Verbal Elaboration	·84	–·30	·28	·03	·87	·31	·07	–·11
Verbal Fluency	·86	·28	–·36	–·05	·27	·94	·03	–·04
Verbal Flexibility	·63	·40	–·26	–·03	·10	·77	·15	–·03
Verbal Originality	·80	·25	–·41	·01	·23	·90	–·03	·03
Verbal Elaboration	·85	·32	–·28	–·06	·28	·90	·11	–·07
Intelligence-Semantic Section (AH4)	·10	·72	·54	·22	–·07	·09	·92	·05
Intelligence-Figural Section (AH4)	·19	·65	·63	·06	·05	·08	·91	–·13
Age	–·20	–·03	–·30	·93	–·09	–·05	·06	·99

The eight divergent thinking measures loaded highly on the first unrotated factor. This could be interpreted as divergent thinking. After rotation, the general factor clearly divides into a verbal and a non-verbal divergent thinking factor. Not only are the two types of divergent thinking independent of intelligence, they are also independent of one another. Interestingly, Fluency, Flexibility, Orginality, and Elaboration did not emerge as separate factors. This may be the result of there being fewer than three tests for each construct. The two intelligence subtests alone load highly on the third factor. Age emerges as a specific factor.

IV.—DISCUSSION.

In this sample of Irish public grammar school pupils, divergent thinking and intelligence have emerged as separate dimensions. There is also a separation between the verbal and non-verbal divergent thinking measures; however, this distinction is not as clear as that between divergent thinking and intelligence. Whether or not these Minnesota tests are measuring a unique underlying dimension, as does intelligence, is not entirely clear from these data.

These results are extremely similar to those found by Madaus (1967a) in his American sample. Two possible explanations for this similarity across cultures are offered:

First, the trait of divergent thinking may not be affected by cultural variables, age, or education. While the magnitude of the scores might be uniformly affected within a culture by such variables, the trait itself is not affected, hence the factor-structures remain constant. These data might be interpreted, therefore, as lending support to the construct validity of the tests used.

The second explanation for the similarities of the factor structures is that the scores reflect a methods factor to a greater degree than they do a trait factor.

In other words, methods factors such as scoring procedures, instructions, and test situation (group *versus* individual, speed *versus* power testing, etc.) may determine to a large extent the nature of the factor structure, regardless of the population used. The relative contribution to test results of trait and methods factors have not yet been studied. What is needed is a series of carefully designed studies with diverse samples, using either the Campbell and Fiske (1959) or the Bock and Bargmann (1966) models for the separation of trait and methods factors. Until this systematic isolation of the contribution of these factors is completed, the true relationship between intelligence and divergent thinking factors cannot be determined with complete confidence.

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THE PERCEPTION OF LINGUISTIC STRUCTURE IN LEARNING TO READ

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SUMMARY. The first *ad hoc* investigations of i.t.a. have established its practical effects in the early stages of learning to read. However, further work is needed to determine *exactly how* psychologically i.t.a. produces the observed improvements in reading and spelling. The theory is proposed that i.t.a.'s clarification of linguistic structure facilitates perception of phonemes, spoken-words, graphemes and written words as individual units, and that this is an important factor in the superior achievements of i.t.a. taught pupils. It is argued that, contrary to Vernon's view, this perceptual facilitation should also lead to improvements in 'the process of synthesis' which she has described.

I.—INTRODUCTION : THE ITA EXPERIMENTS.

THE original experiments with the Initial Teaching Alphabet (i.t.a.) were concerned with the practical question, "Is the traditional orthography (T.O.) of English an important cause of difficulty in learning to read?" The i.t.a. writing-system was used as a representative example of the general principles of simplifying and regularising the conventional writing-system. An experimental group of subjects learned to read and write with i.t.a., and their attainments in i.t.a. were compared with the T.O. attainments of a control group learning to read and write in T.O. For practical present-day educational purposes, it was necessary also to investigate the transfer of learning from i.t.a. to T.O. reading, writing and spelling in the experimental group pupils.

Full details of the aims, methods and results of the experiments have been reported in Downing, *et al.* (1967) and Downing (1967). Briefly the findings were :

(1) i.t.a. pupils were significantly superior in attainments in reading and writing during the period when they were learning i.t.a. and being tested in i.t.a. (the first 1½ years).

(2) At the transition stage, beginning in the middle of the second year, i.t.a. subjects read T.O. less well than they could read i.t.a., but no worse (and no better) than T.O. subjects.

(3) At the end of the third year, the T.O. reading attainments of the i.t.a. subjects were significantly superior to those of the T.O. subjects. But the degree of superiority was educationally less important than in the first period when both learning and tests were in i.t.a. for the experimental group.

(4) The T.O. spelling attainments of the i.t.a. subjects were equal in mid-third year and significantly superior in mid-fourth year to those of T.O. subjects.

Findings 1 and 2 above have been confirmed in a second experiment by Downing and Jones (1966) but items 3 and 4 are still under investigation.

Although these experiments were designed as *ad hoc* investigations of a particular applied problem in the teaching of reading, they have produced data which have considerable theoretical interest also.

II.—THEORETICAL CONSIDERATIONS.

Vernon's (1957) comprehensive review of research on backwardness in reading led her to conclude that a major cause of reading problems is " general cognitive confusion." She found that the child with " real reading disability . . . appears hopelessly uncertain as to why certain successions of printed letters correspond to certain phonetic sounds." In reviewing the research evidence on the perception of individual letters she concluded that this was not a great difficulty. Even in regard to the problem of reversible letters (for example, d, b), " most experimenters have found that, if the child is given time to perceive the letters carefully, he can differentiate them with fair accuracy by the age of 6–7 years. The real difficulty lies in remembering which of the reversible letter shapes corresponds to which sound."

Another type of spatial problem in reading is the tendency found in many reading disability cases to reverse or confuse the order of the letters in a word (e.g., ' saw ' for ' was '). This is frequently cited as a sympton of dyslexia (e.g., Money, 1962 ; Miles, 1967). Vernon has commented on the frequency with which this appears in normal young beginners. She states : " The order of letters in words is a matter of indifference to young children, and they have great diffculty in remembering the correct order, and hence in differentiating words containing the same or almost the same letters in a different order."

Thus, in these two passages, Vernon seems to postulate the importance in the early stages of learning to read of (*a*) remembering grapheme-phoneme relationships and (*b*) ordering the graphemes (with associated phonemes) within a word. Her psychological analysis seems to be supported by Halle's (in press) linguistic comparison with an ideographic system :

" In order to transcribe a Chinese word the writer must remember the character ; i.e., the sequence of strokes that represents the word in question. Since the strokes are arbitrary symbols the writer's or reader's task is equivalent to that of a person trying to remember telephone numbers. Since in order to read a newspaper one needs to be able to read several thousand words, the person who wishes to read a Chinese newspaper must have memorised several thousand arbitrary stroke sequences. This is roughly equivalent to memorising several thousand telephone numbers, a task that is far from easy and in the case of writing and reading is also quite unnecessary."

Although some may question Halle's use of the term ' sequence ' in this description of the Chinese characters, his analogy with the arbitrariness of telephone numbers (quite apart from their sequence) brings out very well by contrast the principles upon which alphabetic writing-systems are based. He continues :

" The reason that this burden on the memory is quite unnecessary is that instead of representing words by arbitrary symbol sequences it is possible to represent words with the help of symbols that are related in specific ways to the sounds that compose the word. This is the idea underlying alphabetic and syllabic writing-systems, and it capitalises on the fact that knowing a word usually means knowing its pronunciation as well as its meaning. Hence if we want to write a word instead of writing down some arbitrary sequence of strokes which have to be memorized, we write down the sounds that compose the word (or rather its *signals*) which need not be memorized especially as we already know them. Thus alphabetic writing may be likened to a telephone system where to dial a person you need only dial his name. Clearly in such a system there is no need for phone books or for memorising phone numbers, since a person's name is his number. And alphabetic orthographies are superior to logographic orthographies precisely because they obviate the need for memorizing phone numbers, as it were."

Vernon's behavioural description taken together with Halle's analysis of the purpose and construction of alphabetic writing-systems, indicates the importance of remembering grapheme-phoneme relationships and the ordering of graphemes and phonemes in written and spoken words respectively. In other words and put more generally, the phonemic units and structure of the spoken language and the graphemic units and structure of the written language and the relationships between the spoken and written forms are of fundamental importance in learning to read in a language with an alphabetic writing-system. These theoretical implications are presented in detail in Downing (1969).

But Vernon's and Halle's descriptions assume certain pre-requisite perceptual abilities.

For example, although 6—7-year-olds are well able to discriminate between letter shapes, and at even earlier ages can discriminate between phonemes in continuous speech, they may have difficulty in conceptualising such units. Reid (1966) found that beginners are very confused about such terms as ' word,' ' letter,' ' number,' ' sound.' They use them interchangeably at first, and, only after considerable experience, do they develop the correct technical vocabulary. This seems to reflect their confusion regarding these units of language.

On the other hand, children do not need to be able to explain the concepts of ' word ' and ' phoneme ' as units in speech in order to function effectively in speaking and listening. Cherry (1957) has stated this general principle, " the user of signs need not know the rules."

However, it seems plausible that the problems of remembering grapheme-phoneme relations and ordering these units appropriately arise from the " general cognitive confusion " about these tasks in reading, to which Vernon attributes reading backwardness. This confusion may in turn, at least in part, be due to a lack of understanding of the structure of language and a related difficulty in perceiving as units, spoken-words, phonemes, written-words, or graphemes. This is what Reid's research seems to indicate.

The results of the i.t.a. experiments mentioned earlier in Section I, taken together with those of a study of spelling by Peters (1966) seem to show that the superior achievements in reading found in the former investigation occurred because i.t a. clarifies the structure of English, as was suggested by the latter research. In contrast T.O. causes confusion because it conceals the units and their organization both in the written and the spoken forms of the language.

There are four chief ways in which i.t.a. seems to clarify the structure of English:

(1) It increases the frequency of experiences of regularity of grapheme-phoneme correspondences in a wider variety of contexts, e.g., the phoneme in *eye*, *I*, *aye* in T.O.'s *I like my pie* becomes ie liek mie pie in i.t.a. (Note how this occurs in natural English sentences).

	T.O.								i.t.a.		
	t	h	o	u	g	h	t		th	au	t
CHARACTER NUMBER...............	1	2	3	4	5	6	7		1	2	3
PHONEME NUMBER	1		2				3		1	2	3

(2) i.t.a. spellings more frequently signal correctly the number of phonemes in a word, e.g., in the word 'thought'.

(3) i.t.a. spellings more generally indicate the temporal order of phonemes, e.g., 'extreme'.

<table>
<tr><td></td><td colspan="8">T.O.</td><td></td><td colspan="7">i.t.a.</td></tr>
<tr><td></td><td>e</td><td colspan="2">x</td><td>t</td><td>r</td><td>e</td><td>m</td><td>e</td><td></td><td>e</td><td>k</td><td>s</td><td>t</td><td>r</td><td>єє</td><td>m</td></tr>
<tr><td>CHARACTER NUMBER.......</td><td>1</td><td colspan="2">2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td rowspan="2">PHONEME NUMBER.......</td><td></td><td></td><td></td><td></td><td></td><td></td><td>7</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
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</table>

(4) i.t.a. generally removes T.O.'s false clues to structure, e.g., the letter *o* in *some women do go on* represents five different phonemes. In i.t.a. each is signalled as different thus: sum wimen dω gœ on

The results referred to earlier in section I may be explained most economically by this principle of clarification of structure in i.t.a. In particular, the more rapid learning of reading by i.t.a. subjects seems likely to be due to improved perception of the structural components as units and their organisation in spoken and written language. But it is the results of the transfer from i.t.a. to T.O. which most strongly suggest this hypothesis. During the transition phase itself i.t.a. pupils read T.O. at least as well as T.O. pupils, and a year later i.t.a. pupils were actually superior in T.O. reading. In spelling T.O., i.t.a. pupils were at first equal to T.O. pupils and later superior. This suggests that i.t.a. subjects retained their clearer understanding of linguistic structure and utilised it effectively as a frame of reference for mapping the more complex T.O. system.

This hypothesis is suggeted also by the investigation of Peters. She found significant differences in the types of T.O. spelling errors made by i.t.a.-taught pupils and T.O.-taught pupils. " i.t.a. children attacked words systematically," whereas " T.O. children made significantly more unclassifiable errors, errors of perseveration and errors suggesting faulty auditory perception." Peters concluded that the 'perceptual training' afforded by i.t.a. is transferred to spelling behaviour in T.O.

Vernon (1967), in her review of Downing's original applied research on the effectiveness of i.t.a., argues that the more regular grapheme-phoneme correspondence in i.t.a. may not " overcome what seems to be the principal difficulty : that the child, knowing how to sound printed letters and graphemes, cannot combine these into total sound patterns which match the sound patterns of words as he commonly pronounces them " However, the theory proposed in this present article, would predict the contrary. It seems possible that, if i.t.a. facilititates the child's perception of the unitary nature of such items as the individual word and the individual phoneme, this is associated with the understanding that words are composed of phonemic units, and this would facilitate the 'process of synthesis' which Vernon describes.

Peters' concept of 'perceptual training' is not to be equated with the notion of teaching the relevant linguistic concepts and the rules of the code—as is usually envisaged in most 'phonic' methods of teaching reading. Cherry's comment, quoted earlier, is apt here again. Reid's discovery of young beginners' confusion about such concepts as 'word,' 'letter,' 'sound' did not lead her to propose 'lessons' to 'teach' these concepts. Instead, she suggested the need for "fostering of the understanding of classification, order and regularity."

Piaget (1959) states: "A child is actually not conscious of concepts and definitions which he can nevertheless handle when thinking for himself," and "verbal forms always evolve more slowly than actually understanding." Vygotsky (1962) considers the ineffectiveness of the deliberate teaching of concepts thus: "Direct teaching of concepts is impossible and fruitless. A teacher who tries to do this usually accomplishes nothing but empty verbalism, a parrot-like repetition of words by the child, simulating a knowledge of the corresponding concepts but actually covering up a vacuum."

In contrast to 'phonic' methods of teaching, which proceed by selecting T.O. words with regular grapheme-phoneme relationships and deliberately teaching the rules of association (e.g., the 'magic E' at the end of words like *lane, time) cove,* i.t.a. provides what Peters calls 'perceptual training,' through a wide range of *concrete experiences* of normal language.

III.—NEEDED RESEARCH.

There is clearly a need for further research on i.t.a. But this should be focused no longer on the simple practical issue of the effectiveness of this writing-system. That issue seems to have been settled by the completed investigations. i.t.a. does appear to be more effective than T.O. But what is not known is *exactly how* this result is achieved psychologically. Experiments are need to test two major hypotheses:

(1) The clarification of linguistic structure by i.t.a. facilitates auditory and visual perception of phonemes, spoken-words, graphemes, and written words *as separate units.*

(2) This facilitation is correlated with superior achievements in reading, writing and spelling.

The same experiments could test the hypothesis that, if i.t.a. facilitates perception of linguistic units *as units*, this will lead to improved ability in the 'process of synthesis' which Vernon suggests may not be affected by i.t.a.

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THE CONSTRUCTION OF AN ORAL COMPOSITION QUALITY SCALE

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SUMMARY. The aim of the study was to produce an oral composition quality scale for the 15—16+ age level, and to evaluate it by impression, by a semantic differential technique, and by linguistic analysis. 130 students representing all grades of oral ability were recorded on the same personal topic, and 10 talks in random order were finally selected as the final sample. Assessment by experienced teachers and students showed the former to be more reliable, and impression to be more reliable than semantic differential, while certain linguistic measures correlated highly with the grand ranked order.

I.—INTRODUCTION.

MANY quality-scales have been constructed for written English. By a quality-scale is meant a series of compositions arranged in order from the very good to the poor. The pioneering scale of Hillegas (1912) was followed by scales from such workers as Van Wagenen (1921), Burt (1922), Boyd (1924) and Schonell (1946). The scales are of use in helping teachers and examiners to evaluate their own judgments. They are of particular value in two situations ; one is where the judges are inexperienced (young teachers, for instance) ; the other is where the material to be judged is new in kind, or where the standards by which it is to be judged are changing. Thus *Assessing Compositions* from the London Association for the Teaching of English (1965) was an attempt to produce a scale, relevant to CSE, which was based on assumptions about good English, different from those in the GCE examination.

In the field of oracy both these conditions apply. There is little experience at all in the evaluation of speaking and listening ; and the standards by which they are to be judged cannot be those derived directly from reading and writing. It seemed clear, therefore, that the construction of oral composition scales for a variety of levels would be of great value. This paper describes the construction of one such scale. The few oral composition scales that have been constructed come from the United States—Hosic (1925), Beverley (1925), Harring (1928). As Betts (1931) pointed out, their methods of obtaining data were unreliable and inaccurate. He showed that a longhand writer could record only 32 per cent of the total words spoken with 85 per cent accuracy, and that a stenographer could record only 59 per cent with 83 per cent accuracy. Netzer (1939) used recording devices, but had no equipment which could be used by non-experts, and his samples had to be transcribed for assessment ; they were thus being assessed as written English. In other words, the lack of a tape-recorder vitiated all the work done in this field. No further attempts have been made in the last 30 years. The oral composition quality-scale described below seems to be alone in a deserted field.

II.—AIMS.

It was felt that the research ought to be of some immediate use. It was therefore decided to work with the needs of the CSE examination in spoken English in mind, considering both the qualities of the English produced and the means of assessing it.

The aims of the research therefore were :

(1) To produce a quality-scale for *one kind* of spoken English at the 15+ — 16+ level.

(2) To construct an assessment scale using the semantic differential in order to anwer the following questions:

(*a*) Is it an effective means of measuring spoken English?

(*b*) Is it a more efficient measuring device than general impression or analytic marking?

(*c*) Is it more helpful to inexperienced assessors of speech than traditional methods?

(3) To ascertain which factors are considered important in an oral composition and which qualities in the subjects' speech are applauded or reproved.

(4) To discover which linguistic features discriminate between those subjects high and low on the composition scale.

III.—CONSTRUCTION OF THE SCALE.

Five English teachers in two comprehensive schools were asked to provide a sample of final-year CSE pupils who seemed to them to represent all grades of oral ability (i.e., A to E) in the examination. A sample of 130 was obtained (average age 15 : 8) from which 39 pupils of varying ability were selected, and these pupils provided 39 oral compositions which were recorded on tape. In the CSE examinations a choice of topic is allowed. For the purposes of standardisation it was thought necessary to stipulate one topic, suitable to both boys and girls, and within the understanding of the less able. On the basis that children talk with most clarity and assurance when recounting first-hand experiences, and that some encounter difficulty when talking on topics that demand abstraction, it was decided that a personal experience (which would probably include description and narration) would be most suitable. Accordingly, " One of the best times of my life " was chosen. The subjects were told of the topic a week beforehand. They were asked to speak for three to four minutes without notes to a group of approximately six of their compeers, who were not part of the sample. A pre-arranged signal was given just before the four minutes expired. The talks were given under good recording conditions.

The 39 tape-recorded talks in random order were then heard individually by four experienced teachers of English. Each teacher graded the talks, using the A to E letter-scale. From the pooled-judgment of these assessors 10 talks were selected that seemed to represent the widest spread of ability and all the grades A to E. These talks were copied on to another tape in random order and constituted the final sample.

IV.—METHODS OF ASSESSMENT.

40 assessors (20 teachers and 20 students) were used. A group of this size is considered to be highly reliable for pooled judgment purposes. The teachers, members of the Birmingham Branch of the National Association for the Teaching of English, were all specialists in English, with a mean teaching experience of 11½ years. Three of the students were in their third year at a college of education and the others were English graduates on a one-year certificate of education course in a university department of education. The assessors were carefully briefed both as to the purpose of the research and the methods of marking.

Two methods of marking were used: (i) the conventional impression-marking, using a numeral scale of 1 to 10, within the grades A to E; (ii) a form of semantic differential. One group of 10 teachers (group B) and one group of 10 students (group D) used the semantic differential, whilst the other group of 10 teachers (group A) and the other group of 10 students (group C) assessed by impression. Those marking by general impression scored out of 10, those by semantic differential by marking on a seven-point scale. In addition, all assessors were asked to write brief critical comments on each of the oral compositions on the mark-sheets provided.

General impression marking is by now a familiar device and will not be described here. As far as is known, however, the semantic differential has not been used to assess oral production, and thus there are no scales to which one can refer. The work of Becker (1962) indicates that judgments of speech are made on Content, Language Usage, and Delivery, and thus polarities were devised to each one of these three factors. Since the adjectives chosen had to be relevant to language, pairs were chosen which had been factorised in work on written language by Osgood (1957), Smith (1959), and Carroll (1960), especially those with a high positive loading on *evaluation*. There were 12 pairs chosen. Examples are: (Content) ordered-chaotic, interesting-boring; (Delivery) clear-hazy, vigorous-feeble.

The scores for the 12 items on the semantic differential mark-sheets were totalled out of 84 and then expressed as a mark out of 10, to agree with the general impression mark. All the scores were then put on a master-sheet in a matrix of 40 × 10 scores under four headings: Group A (teachers' impression); Group B (teachers' semantic differential); Group C (students' impression); Group D (students' semantic differential). Each score on the master-sheet was correlated by an electronic computer against the grand mean of the 40 assessments. Having converted the Pearson product moment correlations to Fisher z scores to obtain as near normal a distribution as possible, a two-way analysis of variance was made to compare the reliability of the two groups of assessors.

From the grand-mean scores on the master score-sheet (that is, the pooled-judgment of 40 assessors) an oral composition scale was produced by putting subjects in rank order.

V.—RESULTS OF THE ASSESSMENTS.

From the grand mean shown in Table 1, the rank order for the 10 compositions was obtained. Thus rank order represents the composition-scale.

TABLE 1

THE MEAN SCORES OF TEACHER AND STUDENT GROUPS, MARKING BY GENERAL IMPRESSION AND BY SEMANTIC DIFFERENTIAL.

Subjects in Random Order	Group A T/GI	Group B T/SD	Group C S/GI	Group D S/SD	Grand Mean
1	5·3	6·3	5·8	6·0	5·8
2	5·2	5·0	5·3	4·1	4·9
3	8·9	8·0	8·2	6·6	7·9
4	2·9	3·3	2·5	3·0	2·9
5	8·3	6·8	8·4	6·9	7·6
6	1 1	2·1	1·1	2·0	1·5
7	9·0	8·1	9·6	8·0	8·7
8	4·8	4·8	4·8	5·2	4·9
9	6·9	6·2	5·5	6·0	6·1
10	3·8	4·0	3·9	3·7	3·8

Using the grading system A for 10 to 8+; B for 8 to 6+; C for 6 to 4+; D for 4 to 2+; E for 2 to 0, the following rankings and gradings were obtained :

TABLE 2

RANKINGS AND GRADINGS.

Rank	GI/SD	Grade
1	8·7	A
2	7·9	B
3	7·6	B
4	6·1	B
5	5·8	C
6	4·9	C
7	4·9	C
8	3·8	D
9	2·9	D
10	1·5	E

The first-placed composition on this scale does not represent a good example of the highest possible rank, but it is considered that all other ranks represent the range of this particular kind of oral composition satisfactorily.

The mean correlations of the scores of each group of assessors with the scores of the grand mean (40 assessors) yielded the following results :

Mean correlation of Group A (T/GI) ·941.
Mean correlation of Group B (T/SD) ·894.
Mean correlation of Group C (S/GI) ·913.
Mean correlation of Group D (S/SD) ·854.

An analysis of variance of teachers and students as assessors and of general-impression marking and marking by semantic differential was carried out as in Table 3.

TABLE 3

ANALYSIS OF VARIANCE OF TEACHERS AND STUDENTS AS ASSESSORS AND OF GENERAL IMPRESSION MARKING AND MARKING BY SEMANTIC DIFFERENTIAL

Source	Sum of Squares	D.F.	Variance	'F' Ratio	Significance
Teachers/ Students..	·3451	1	·3451	4·6993	5%
GI/SD......	·8383	1	·8383	14·0544	1%
Interaction..	·0038	1	·0038	·05170	N.S.
Error	2·646	36	·7350		

The findings from the figures in Table 3 suggest:

(i) That teachers are significantly more reliable than students in the assessment of oral composition (at the 5 per cent level of significance).

(ii) That marking by general impression is very significantly more reliable than by the use of semantic differential (at the 1 per cent level of significance).

The findings in (i) are to be expected. But further evidence is necessary before one can make a definitive statement about the apparent failure of the semantic differential. The items on the scale had not been factorised specifically for a speech situation, and possibly there were too many factors and items in each factor, so that the assessors may have had difficulty in discriminating the items. Further, the assessors were new to the technique; they may also have assigned a different meaning to the polarised adjectives from that intended, or found the adjectives insufficiently meaningful. Taking these things into account, further research with the semantic differential may yield more encouraging results.

As mentioned above, short evaluative comments were obtained from the assessors, and they were analysed in Becker's categories. Expressed as percentages they were as follows: Content 46·7 (teachers 49·1, students 46·7); Language Usage 16·1 (teachers 17·5, students 14·8); Delivery 37·2 (teachers 38·4, students 36·1). It seems rather surprising that specialists in English should depress language usage so significantly in comparison with the other factors. Under Content, interest and organisation of materials is most commented upon; under Language Usage, vocabulary and grammar received two-thirds of the comments; under Delivery, fluency, liveliness and variety are most mentioned.

VI.—LINGUISTIC ANALYSIS.

The oral compositions were analysed linguistically in order to see how far scores devised on linguistic content correlated with the rankings obtained above. Traditional grammar was used for analysis. It was considered that the first and second level analyses of both Strickland (1962) and Loban (1963), although very valuable and an advance on what has been done in the past, did not analyse structural complexity sufficiently. A formula was therefore devised to attempt to remedy these shortcomings. It is not possible to describe this in the present article nor to give in detail the conclusions. The procedure was to correlate each linguistic feature with the rankings, using Spearman's rank correlation coefficient. In sum, it appears that significant linguistic features correlate highly with ranked positions. In other words, had the subjects been ranked by their scores on the linguistic features only they would have occupied the same positions on the scale as they do by the pooled-judgment of the 40 assessors.

VII.—CONCLUSIONS AND DISCUSSION.

(1) A scale for one particular kind of oral composition (a personal account, usually involving narration and description) at the CSE level was constructed. Grades from A to E were represented, but it is thought that the top rank does not represent a good A, and that the lowest rank represents the lowest grade of E.

(2) It is considered that this scale could be used by teachers (especially those who have had no experience of work at the CSE level) to estimate their pupils' oral composition of this particular kind. They could do this by comparing

a pupil's oral production with the samples on the scale and then assigning the scale-value of the sample that most nearly equals their pupil's oral production.

(3) The comparisons could be made by listening to the tape-recording of the sample, noting its rank on the scale, reading its transcript, and reading the assessors' comments made on it.

(4) The use of the semantic differential was not found to be an effective measure of oral production in this study, but it is suggested that this could be the result of weaknesses in the scale constructed and the methods used for assessment rather than the technique itself. Further research is needed to substantiate or refute these findings.

(5) One of the most interesting results of this study is the perfect correlation of the scores on the significant linguistic features with the ranked positions on the composition scale.

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THE VALIDITY OF THE BRISTOL SOCIAL ADJUSTMENT GUIDES IN DELINQUENCY PREDICTION

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SUMMARY. Two different approaches are used to analyse the data, given in the manual, on the usefulness of the Bristol Social Adjustment Guides as predictors of delinquency. The two methods each show that the predictive efficiency in terms of the ratio of valid positives to false positives is no greater than a quarter of that claimed in the manual and may be even less. It is suggested, therefore, that the use of the guides for this purpose be discontinued.

I.—INTRODUCTION.

FOR some years now psychologists have attempted to devise instruments that can identify those children in the population who will be delinquent at some time in the future. The most common method of constructing such scales is to make a checklist of characteristics that occur more frequently in groups of already known delinquents and to use the resulting scale as the means for assigning other children to either pre-delinquent or non-delinquent categories.

The Bristol Social Adjustment Guides were developed by using a somewhat different approach. An initial set of statements describing aspects of maladjusted behaviours was first gathered by its author during extensive case conferences with social workers. These statements were ordered, refined and, in the case of the Child in Schools form (with which the present discussion is principally concerned) then circulated to teachers for comment and amendment before a firm list of items was drawn up. The items were later administered to three groups of children classified as either maladjusted, unsettled or stable, and numbering 234, 214 and 165, respectively. Results for each item were then statistically tested by what Dr. Stott, their author, refers to as a 'para-Chi square' technique; and the items were either accepted, re-worded or rejected according to the 'para-Chi square' value obtained. The retained items were then assigned to various categories devised for behaviours that Stott considered to be of a similar type.

The delinquency prediction scale itself, taken from the Child in School form, consists of 54 items which Stott found occurred at least four times more frequently among 414 Glasgow probationers than among 404 apparently non-delinquent boys. The items in this group are weighted in the following way. Those which occurred the least frequently among the delinquent group were assigned a score of 1, those which occurred five times as frequently among delinquents as among the non-delinquent group were given a weighted score of 2 and so on up to 10.

To use the scale the child's behaviour is checked against the list of items and then scored by adding together the appropriate weightings for the checked items to produce a delinquency prediction score. Stott has also produced a preliminary sorting checklist of six questions and he suggests that this be used as a screening device to save time in completing and marking the full questionnaire for all individuals initially under consideration.

The norms given for the delinquency prediction score are based on the results of Stott's survey of 818 Glasgow children. Two rather useful indices are used in the manual to express these norms: they are selectivity and predictive range. For any given point selectivity represents the number of actual delinquents correctly predicted, as a proportion of all persons predicted to become delinquent; while predictive range gives the number of delinquents correctly predicted as a proportion of all delinquents. In terms of Table 1 the selectivity is $\frac{a}{a + c}$ and the predictive range is $\frac{a}{a + b}$.

TABLE 1

Schema for Demonstrating Predictive Accuracy Relative to Actual Outcome.

	Test Prediction		
	Delinquent	Non-Delinquent	Total
Outcome:			
Actual Delinquent ..	a (Valid positives)	b (False negatives)	a+b
Not delinquent	c (False positives)	d (Valid negatives)	
Total	a+c		

Reading off a few values from the two graphs of selectivity and predictive range given in the manual we find that a prediction score of 15 has a selectivity of 65 per cent. and a predictive range of 51 per cent, while a score of 20 has a selectivity of 74 per cent and a predictive range of 42 per cent. Supposing that the rate of court convictions for an average cohort during the juvenile period is about 10 per cent (as it appears to be at present in New Zealand, Marsh and Darwin, 1967) then we would expect the following outcomes, shown in Table 2, per 100 children.

TABLE 2

Expected Results per 100 Children According to the Graphs of Selectivity and Predictive Range Given in the Manual.

	Prediction (Score 15)		
	Delinquent	Non-Delinquent	Total
Outcome:			
Actual Delinquent ..	5·1	4·9	10·0
Not Delinquent	2·7	87·3	90·0
Total	7·8	92·2	100·0

	Prediction (Score 20)		
	Delinquent	Non-Delinquent	Total
Outcome:			
Actual Delinquent ..	4·2	5·8	10·0
Not Delinquent	1·5	88·5	90·0
Total	5·7	94·3	100·0

These figures show a pleasingly high ratio of valid positives (correct identifications as delinquents) to false positives (incorrect identifications as delinquents) 5·1 to 2·7 and 4·2 to 1·5, respectively. But, in fact, the actual results from the Glasgow study that Stott gives elsewhere are not consistent with them.

II.—THE FIRST ANALYSIS.

In a separate paper Stott (1963) gives the following data from the Glasgow survey:

TABLE 3

NUMBER OF INDICATIONS OF BEHAVIOURAL DISTURBANCE GIVEN BY STOTT.

	0–4	5–9	10–14	15–19	20–24	25–29	30–34	35–39	40–51	Total
Probationers	45	53	60	68	61	50	31	25	21	414
Controls....	186	104	55	30	15	8	4	2	0	404

At first glance these figures appear to be consistent with the graphs given in the manual for selectivity and range. Recalling, however, that the present rate of court appearances is more like one in 10 than one in two, it becomes obvious that to give a proper perspective to these results the sizes of the above groups should be weighted in the ratio of about nine non-delinquents to every delinquent, rather than the one to one representation given above (Meehl and Rosen, 1955). When this is done the figures in the manual for selectivity and range appear unduly optimistic: especially so since the calculations based on the high rate of one in 10 give an inflated estimate of the predictive accuracy where the rate is actually less than this. For example, if the rate were one in 20, instead, then the data for the control group from the Glasgow study would need to be weighted by 19 instead of nine.

After weighting the data in the manner outlined above, the application of the Bayesian procedure to find the posterior probability of two events (Hogben, 1957) to correct Stott's results to the actual ratio of convictions to non-convictions, produces the outcomes per hundred children presented in Table 4.

TABLE 4

EXPECTED RESULTS PER 100 CHILDREN ACCORDING TO THE APPLICATION OF BAYES THEOREM
(Taking the most extreme 10 per cent. of the population as the cutting point.)

	Prediction		
	Delinquent	Non-Delinquent	Total
Outcome: Actual Delinquent ..	4·2	5·8	10·0
Not Delinquent	5·8	84·2	90·0
Total	10·0	90·0	100·0

Table 4 shows that this yields a ratio of valid positives to false positives of 4·2 to 5·8. This analysis does not necessarily take account of the possibility of the distributions for the two groups being made up of quite different items, nor does it allow for the effects of re-weighting the items according to the method Stott proposes for determining the delinquency prediction score.

We can get a fair estimate of the degree of accuracy of prediction (when these two factors are taken into account) from the following procedure. The manual and scoring template together provide the data for the first three columns in Table 5, namely, the item weighting, the number of items having a particular weighting, and the relative frequency with which the items having the same weighting occur in the delinquent and non-delinquent groups. Column four was obtained by multiplying together columns two and three while column five is column three repeated. Thus, taken together columns four and five show the rate of occurrence for the items in the scale as a ratio between delinquent and non-delinquent groups. Column six is column four repeated and column seven was obtained by multiplying each entry in column five by the factor nine ; so that taken together columns six and seven show the *actual frequency* of prediction items in each group according to their level of weighting.

TABLE 5

DETERMINATION OF THE ACTUAL FREQUENCY OF PREDICTION ITEMS IN THE DELINQUENT AND NON-DELINQUENT GROUPS ACCORDING TO LEVEL OF WEIGHTING.

Item Weight	Relative Frequency D to N–D	No. of Items	Rate of Occurrence		Actual Frequency	
			D	N–D	Delinquent	Non-Delinquent
1	2	3	4 (=2×3)	5 (=3)	6 (=4)	7 (=5×9)
1	4	12	48	12	48	108
2	5	11	55	11	55	99
3	6	10	60	10	60	90
4	7	3	21	3	21	27
5	8	4	32	4	32	36
6	9	3	27	3	27	27
7	10	1	10	1	10	9
8	11	3	33	3	33	27
9	12	2	24	2	24	18
10	13	5	65	5	65	45

These figures show that on the *average* there is a much higher chance of the prediction items registering among the delinquent group than among the non-delinquent one. A comparison of averages alone is not useful here, however, for as Table 5 shows, the distributions of checked items for the two groups have quite different shapes, the non-delinquent group having a strong positive skew while the probationers group has only a slight one. And as the group of non-delinquent children is only about one-ninth of its proper size (relative to the size of the delinquent group) we can assume that the range of scores given for them is somewhat attenuated, in that a much larger sample would throw up some individuals whose scores are still more extreme. Thus the tail of the distribution of scores for the non-delinquent population is probably even more exaggerated than the present data show, giving still more overlap in the range of scores for the two groups.

The only items that are likely to determine an overall predictive outcome where the number of valid positives is greater than the number of false positives (regardless of weightings) are those that occur more than nine times as often among delinquents as non-delinquents. Inspection of columns six and seven in Table 5 shows that there are only 11 of these; and if we consider the effects of restriction of range on the non-delinquent group, it could well be that there are even fewer than 11 items in the scale that discriminate adequately at this point.

It should be remembered too that the data being used here are not derived from predictions at all, but from a group of already identified delinquents and a non-delinquent group both tested at the same point of time. From the wealth of recorded observations about the characteristics of other psychological tests it is fair to say that even the unpromising results given above are likely to be substantially better than the result from comparing *prediction* and *outcome* for the same individuals over a period of time.

III.—THE SECOND ANALYSIS.

It is possible, however, to get an estimate of what the upper limit of the predictive validity for the Guides is liable to be; unfortunately we cannot get a similar estimate for the lower limit. The following section provides, from a different source, some corroborative evidence for the preceding discussion which shows that the use of this scale leads to a very high risk of misclassifying as potential delinquents children who are not delinquent at all.

It is known that the maximum overall correlation obtainable between prediction and outcome (where the outcome criterion is imperfect) is equal to a test's reliability coefficient of stability and equivalence (McNemar, 1962, p. 154). This coefficient in the present case is the correlation of retest results from the same children but taken by different markers after a substantial interval of time. Test-retest correlations of about 0·55 are given in Morris's (1966) study with backward readers. However, only half the of retest data was obtained from different markers, so the coefficient of 0·55 is higher than we could expect if all the markers were different and the results below will tend to be inflated and over-optimistic because of this.

If it is assumed that the joint distribution of the test-retest scores are approximately in the same proportions above and below the 90th percentiles of the two variables, as those of a bi-variate normal distribution showing a correlation of 0·55, then, by consulting tables of the correlation coefficient (Jackson and Phillips) we can show (in Table 6) an estimate of the maximum result of prediction and outcome that is likely for the total population. The validity of this estimate is supported by its closeness to the test efficiency r^2 (30 per cent.); especially as r^2 gives an average for the total range of scores; and the efficiency of the highest scores can be expected to be above the average for all scores.

TABLE 6

MAXIMUM POSSIBLE RESULTS PER 100 CHILDREN FOR THE GIVEN RELIABILITY.
(Taking the most extreme 10 per cent. of the population as the cutting point.)

	Prediction		
	Delinquent	Non-Delinquent	Total
Outcome:			
Actual Delinquent ..	3·5	6·5	10·0
Not Delinquent	6·5	83·5	90·0
Total	10·0	90·0	100·0

Even though these figures show a maximum outcome, which will be optimistic relative to the *likely outcome*, the ratio of actual positives to false positives is only a quarter as good as Stott's claims for the instrument.

IV.—DISCUSSION.

As Table 4 and Table 6 together show, the two quite different methods of analysis produce approximately the same results, namely, a ratio of valid positives to false positives of about four to six.

In trying to assess just how great the difference may be between this ' liberal ' estimate and the actual validity of the Guides the following two points should be kept in mind concerning the item analysis results given in the manual.

First, there is no information given on how the three criterion groups (maladjusted, unsettled, stable) were arrived at.

Secondly, the exclusion of the middle category of results from the analysis by the ' para-Chi-square ' method given in the manual violates the chi-square assumption of continuity. This produces inflated chi-square values so that the items appear to discriminate more than they do in fact (Burke and Lewis, 1949).

In all, the Child in Schools form (at least) is not a good instrument for identifying children who later become delinquent. The high likelihood of misclassification associated with the low predictive efficiency shows that the Guides may constitute a real hazard for the individual children with whom they are used in this way, and the use of the instrument as a predictor should be discouraged.

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THE SIGNIFICANCE OF ‘LIE RESPONSES’ IN THE PREDICTION OF EARLY DELINQUENCY

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SUMMARY. Three measures were obtained concerning 411 boys at primary schools: (i) the degree of Social Handicap of their homes, (ii) school-teachers' behavioural ratings, (iii) the New Junior Maudsley Inventory (NJMI). Four years later, they were screened for records of court conviction and for minor delinquent acts. Boys convicted by their 14th birthday (N=30) were matched for degree of Social Handicap with innocent controls.

Social handicap was found to interact with the three scales of the NJMI, severely handicapped boys being specially high on N. Handicap and teachers' ratings both predicted official delinquency. The contrast between teachers' report and self-report on the L items produced a scale of ‘ Suppression ’ which also predicted court conviction. Among the ‘ low suppressors ’ only, Extraversion predicted conviction significantly. The N scale did not discriminate.

I.—INTRODUCTION.

IN a previous discussion (Gibson, 1967) some difficulties inherent in the testing of delinquent populations were mentioned. Not least among these difficulties are those arising out of the test-faking of some subjects. While clinical populations may in general be presumed to be largely co-operative in their response to treatment and to try to give truthful responses to questionnaires, the same can hardly be assumed of delinquent populations.

The usual means by which we attempt to detect test-faking on questionnaires is by the use of lie scales ; yet the lie score on its own is an ambiguous index. A high lie score may indicate that the subject is indeed lying—perhaps out of vanity and deliberate hypocrisy, or to achieve some imagined gain, or simply to make a fool of the psychologist who may well be regarded with hostility by a delinquent subject. Alternatively, a high lie score may well represent something near the literal truth about a meticulously honest and well-behaved subject.

Salas (1968) has suggested that a very low lie score may indicate a type of test-faking in some circumstances, e.g., making out that one is of bad and unreliable character in order to evade a military draft. This suggestion emphasises the necessity for interpreting the lie score both in the light of the circumstances in which the test is being administered, and with reference to the nature of the subjects tested.

Between the extremes of deliberate falsification and very honest self-appraisal, are all the degrees of lack of insight which, as discussed by Dicken (1959), blur the differences between truth and falsehood. While we cannot accurately discriminate between truth and falsehood, we can at least advance the most parsimonious hypothesis where delinquent populations are concerned. If those who claim never to steal, cheat, assault and lie (actions which are specifically mentioned in most lie scales) when they have run foul of the law for just such transgressions, it is reasonable to suppose that they are indeed liars.

That the lie scores of normal subjects do, to some degree, reflect the truth about objectively verifiable behaviour is a paradox manifest in comparing large groups. Thus groups who are on the whole less troublesome socially, achieve higher group mean lie scores, e.g., girls *versus* boys, younger *versus* older children, 'good' *versus* 'naughty' schoolboys (S. B. G. Eysenck, 1965; Gibson, 1964a, 1967). One cannot extend this conclusion to specifically delinquent groups, for if they reported truthfully about themselves such groups would show very low mean lie scores, and this is not the case (e.g., Field, 1959; McKerracher and Watson, 1968). The implications of these findings is that the lie score is fully meaningful only when it is used in conjunction with some independent measure of habitual behaviour.

A further relevant aspect of research into the responses of delinquent samples on personality inventories concerns the social concomitants of both delinquency and personality responses. It has been found that there is a marked over-representation of the lower socio-economic strata among children in approved schools (Little and Ntsekhe, 1959); therefore, if it were found that the 'neurotic extravert' type of response was very frequent among approved school boys, no very definite inference about personality and delinquency could be drawn. The finding would only be of significance if it were also demonstrated that this type of response was not equally frequent among the law-abiding boys in the lower social strata. For this reason, studies in which the personality scores of established delinquents are compared with national norms (e.g., Little, 1963) are not specially relevant to criminological personality theory. Eysenck and Eysenck (1963) have demonstrated that working-class subjects are higher on both Lie and Neuroticism scales, but it must be pointed out that even within the main working-class groups (defined by the Registrar-General's criteria) there is a considerable degree of stratification in terms of social orientation and handicap, and such stratification may have an important bearing on modes of personality response. In the study reported below, therefore, special care has been taken by a matched-pair technique to allow for social differences bearing upon personality dimensions.

II.—THE PRESENT STUDY.

The population studied consisted of 411 boys attending primary schools in an urban and predominantly working-class area. The following measures were obtained:

(1) *Social Handicap*. The boys' homes were rated on Social Handicap by visiting social workers when the boys were aged between 8 and 10 years. The seven points contributing to the scale were, family supported by social agencies, low job status of father, poor housing, poorly kept accommodation, inadequate income, over-large family, physical neglect of the boy. Thus a boy's home could be scored from 0 to 7 on this scale. Details of this rating scale are published elsewhere (West, 1969).

(2) *Teachers' Ratings of Behaviour*. The boys were assessed at the age of 8+ and again at 10+ by their teachers for their behaviour in school, on a form of assessment which has been described elsewhere (Gibson, 1964b). At each assessment boys were allocated to groups A, B or C; the combination of these two independent ratings was done by summation so that the best-behaved boys, rated A A, were given a score of 1; the worst-behaved boys, rated C C, a score of 5, and others rated intermediately.

(3) *The New Junior Maudsley Inventory* (*NJMI*) (Furneaux and Gibson, 1966). This was administered at the age of 10+ to classroom groups. The administrator read out each item to minimize the effects of semi-literacy, and assistants invigilated. The scales used in this study are the slightly shortened ones referred to by Gibson (1967).

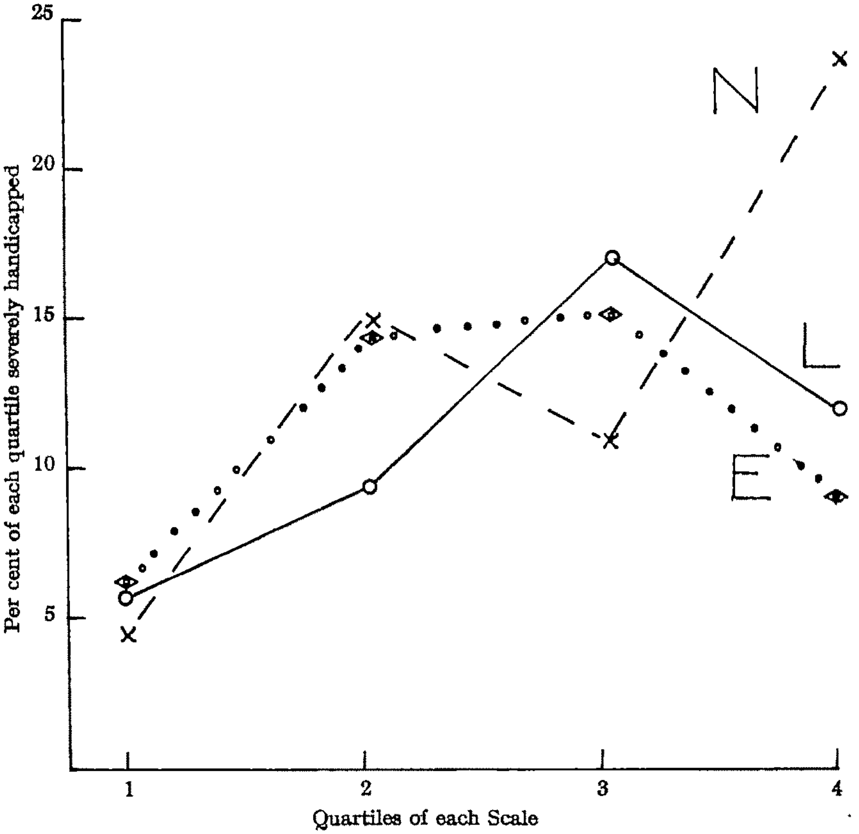
(4) *Delinquency*. Approximately four years later, the records of all the boys up to their 14th birthday were checked with the Criminal Records Office and the Children's Department. In addition to this, there was a fairly close screening by means of reports from parents, schools, police, etc., concerning delinquent acts which were of a lesser nature and had not come before the courts.

III.—RESULTS.

Figure 1 shows the relationship between Social Handicap and the three scales of the NJMI, Extraversion (E), Neuroticism (N) and Lying (L). The population has been roughly divided into quartiles on each scale and the four points on the abscissa indicate the cuts. It may be seen that among those scoring low on each of the three scales there is a smaller proportion of cases coming from severely handicapped homes. The tendency for both E and L is somewhat curvilinear and does not reach statistical significance, but for N the tendency is significant ($\chi^2=11{\cdot}89$ with 3 d.f., $p<{\cdot}01$). These data show the necessity of partialling out the effect of Social Handicap when investigating the personality parameters in this study.

FIGURE 1

RELATIONSHIP BETWEEN THE THREE SCALES OF THE NJMI AND SEVERE SOCIAL HANDICAP



30 boys in all were convicted of indictable offences before their 14th birthday, and eight of these had multiple convictions. Eight of the boys were first convicted before their 11th birthday, and of these four were again convicted before their 14th birthday. There was no report of any delinquency up to this age for 294 boys.

Comparing the convicted boys with all the others on the Social Handicap scale, $\chi^2 = 39{\cdot}22$ with 6 d.f., $p < {\cdot}001$. Because of this very strong association, the convicted boys were each paired with boys of exactly the same degree of social handicap for whom there was no report of delinquency. This matching process was made difficult by the scarcity of 'innocent' boys among those with the severe degrees of Social Handicap.

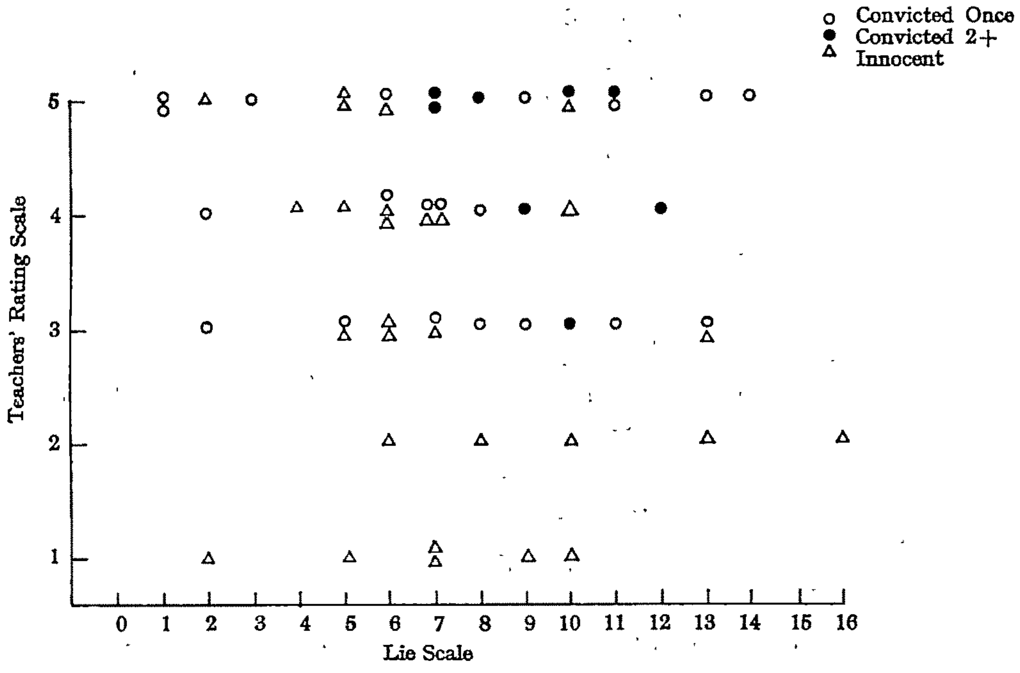
The number of cases is reduced by two since two of the convicted boys (both convicted twice) failed to produce scorable NJMI records because of illiteracy. Figure 2 shows the L scale of the NJMI against the Teachers' Rating scale. The scores of the 28 convicted boys, and those of their innocent matches, are plotted agains these two scales. Two special features of this scatter plot are noteworthy:

(i) The Teachers' Rating discriminates between the two groups with 20/56 misclassified if they are dichotomized at 3+. Applying the Wilcoxon Matched-Pair test (Siegel, 1956) the innocent controls are significantly better behaved ($p < {\cdot}001$).

(ii) The convicted boys are higher on the L scale, and the contrast is particularly striking where the Teachers' Rating is worst. Those boys who were later to be convicted more than once (as shown) were particularly liable to give self-reports of their behaviour on the L scale grossly at variance with their teachers' reports.

FIGURE 2

CONVICTED BOYS AND INNOCENT CONTROLS COMPARED ON TWO SCALES



The data in Figure 2 provide the means for constructing a scale of 'Suppression' (S) with a rationale as follows. If a boy reports of himself that he is very well-behaved (i.e., obtains a high L score) but his two teachers report that he is very badly-behaved, it is likely that he is suppressing the true facts about himself. On the other hand, if he gets a high L score and his teachers report well of him, his report may be reasonably honest. It may be seen that a few boys whose teachers report well of them obtain quite low L scores—this implies a self-critical attitude. The S score was calculated by dividing both scales of the plot into quartiles and summing the quartile scores. Thus, boys in the 4th quartile of both scales scored 8, and boys in the 1st quartile of both scored 2. The convicted and innocent groups are compared on the S scale in Table 1. Here it may be seen that by dichotomizing at either 4+ or 5+ only 17/56 boys are misclassified, the convicted boys having tended to give significantly higher S scores. Using the Wilcoxon Matched-Pair test, $p < \cdot 001$.

TABLE 1

Scores of Convicted Boys and their Matched Controls on the Suppression Scale

	Suppression Scale							Total
	2	3	4	5	6	7	8	
Convicted	0	2	2	9	7	4	4	28
Controls	2	4	9	9	3	1	0	28

By the Wilcoxon Matched-Pair test $p < \cdot 001$.

There is no significant difference between convicted boys and their matched controls on either the E scale or the N scale when comparisons are made without reference to the S scale. However, an interesting association between E and S was found when the convicted and the innocent groups were analysed separately. For the convicted group, E correlates negatively with S ($r = -\cdot 278$) but for the innocent group the association is positive ($r = \cdot 187$). This suggests that 'high suppressors' in the convicted group underplay their degree of E, but 'high suppressors' of the innocent group overplay it.

The 11 matched pairs, where both members of the pair were 'low suppressors' ($S < 5$), were compared with respect to E. In only two pairs did the convicted boy have the lower E score (by the Wilcoxon test $p = \cdot 0344$). Among the other 17 pairs there were 10 where the convicted boys had the lower E score (N.S.).

A similar analysis relating the N scale to the S scale gave no significant results. The value of r between the two scales was around zero for both groups of boys. No combination of the E and N scores produced any significant discrimination between the convicted boys and their matched controls.

IV.—Discussion.

This study is not entirely predictive because a few boys had actually been convicted for the first time before the second school teachers' rating was made and before they had completed the NJMI. The great majority of the experimental group, however, were pre-delinquents at the time when the measures were taken. The criterion of delinquency used, conviction of an indictable offence before the 14th birthday, is a severe one, as most delinquent boys do not get convicted for the first time until after that age. This type of *early* delinquency has a specially strong association with Social Handicap (Gibson and West, 1969).

It is no surprise that the Teachers' Rating was highly predictive of later conviction, as this has been shown in a number of studies (e.g., Mulligan, *et al.*, 1963). What is of greater interest is that the L scale, when taken in relation to behavioural ratings, should have been so predictive of later convictions. The scale which has been termed ' Suppression ' is additionally valuable in that it has enabled identification of a group of 11 pairs of boys who may be presumed to be reasonably honest reporters about themselves. In this group the convicted boys were significantly more extraverted than their matched controls. Since this was not so with the ' high suppressors,' the implication is that delinquent boys who fake their responses on personality inventories do so not only in the direction of the usual sort of social desirability, thus inflating the L score, but also in the direction of underplaying their degree of extraversion. This effect is also reflected in the negative association (r= —·278) between E and S. This tendency was suggested earlier on the basis of some data regarding boys at an approved school (Furneaux and Gibson, 1966).

The fact that there was no significant difference between the convicted and the innocent boys on the N scale draws attention to the fact that, of necessity, the matched controls were rather higher on neuroticism (Mean 6·07, SD=3·48) than the population from which they were drawn (Mean=5·83, SD=2·96). This was because the matching process necessitated taking controls who were among the most socially handicapped part of the population, and it has been demonstrated that Social Handicap is significantly related to N.

It has been shown earlier (Gibson, 1967) that those schoolboys characterised as rather badly behaved in school, tend to score rather low on the L scale. Why the small minority who actually get convicted of indictable criminal offences early on in their lives should tend to differ from their merely naughty classmates, is not easily explained. It may be that such boys, even at their primary schools, are abnormally in revolt against the adult world and are determined to resist any form of psychological investigation if they can. This attitude may show up in a gross discrepancy between their self-report and their teachers' report at the 10+ age level. Perhaps at a later age they will not be so naively unrealistic when reporting about themselves.

This study gives small comfort to all of us who try to investigate the personality dimensions of delinquents by means of inventories. Hathaway and Monachesi (1953) found that the feature of the MMPI response of children which was most predictive of delinquency was the *invalidity* of the records, and this finding is supported by the present study.

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STRUCTURE IN THE SPEECH OF A 2½-YEAR-OLD

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SUMMARY. The structure of the speech of a young child was shown to be more closely related to his activity in an episode and to his immature cerebral processing ability, than to the hierarchical structure of sentences described in linguistic theory. The negative, interrogative and imperative forms were more particularly related to dialogue and shared activity. The groupings of words in remarks, and of remarks in sequences were shown to be like the complexive organisations of children's collections. It is, therefore, proposed that the structure described in linguistic theory does not represent the young child's competence, but is a patterning imposed by adult intelligence, towards which the child's performance develops as he matures and gains experience.

I.—INTRODUCTION.

PSYCHOLOGISTS and linguists have attempted to analyse samples of children's speech in order to try to explain the acquisition of syntax. Speech, however, is more than a collection of remarks—it is an act of communication, wherein the speaker selects from his repertoire whatever symbols and syntactic structures seem to him to be adequate and appropriate. It was thought, therefore, that an investigation into the structures used in different episodes of talking might provide a contribution to the study of children's use of language.

II.—METHOD.

Accordingly the writer proceeded to identify some of the social and activity features of episodes when her son seemed disposed to talk spontaneously, and having done this, made a collection of 10-minute samples of such speech when the child was between 2 : 7 years and 2 : 10 years old. The episodes were identified as featuring monologue when he was playing alone ; dialogue when he was exchanging remarks with his 4-year-old sister ; and social monologue when he was talking in his sister's presence, but not exchanging remarks. Towards the end of the period, it was not easy to distinguish between the two social types, since social monologue seemed to be an increasingly successful process of scanning for dialogue. However, a check on the distribution of pronouns between the categories showed statistically significant differences, tending to confirm the validity of the classification. On each occasion the nature of the activity in which the child was engaged was recorded.

The children were accustomed to seeing their mother writing from time to time while they played, and had grown to interrupt minimally on such occasions. This afforded her the opportunity of making recordings of which the children were totally unaware, while her presence was a constant, non-disturbing feature of all the observed episodes. Unfortunately, written recording, the very method which maintained the undisturbed peace of the home and ensured spontaneity of speech without any adult participation, also restricted recording to the remarks of the younger child. However. it did enable the mother to record immediate decisions about the interpretation of remarks, thus increasing the reliability of recording.

There was no real difficulty in identifying remarks, or utterances as some have called them, since the child made well defined pauses between them, and intonation cues were clear. They were found to approximate well enough to sentences in the adult grammar for an analysis of structure to be made, according to the scheme adopted by Templin (1957), but in view of the recent trend towards using transformational grammar in studies of the acquisition of language, the author decided to reanalyse the remarks in this mode.

It has been said that one cannot assume that a child's grammar is a form of the adult's, nor even that it is moving towards the adult's, and, therefore, comparisons should not be made. But this is to ignore a presupposition of linguistic theory—namely, that any grammar depends for the analysis of strings or sentences into immediate constituents, on the intuitive distinctions of native speakers Whatever the nature of the ability to make these distinctions, they are a pre-requisite of verbal communication. When a child's remarks are understood by an adult whose awareness of structure is explicit, it is possible for that adult to assign an immediate-constituent analysis to those remarks; even though they are less than complete by adult standards. It has also been said that linguistic theory is concerned with the structure of well-defined, theoretical sentences, not with the structure of speech which sometimes wanders from the paths of righteousness; but if one cannot use such theoretical sentences as a yardstick, what can one do with them? In the present study the child's remarks were matched with appropriate syntactic structures, and the relationship of these structures to the episodes of use was then examined.

III.—Analysis of remarks.

The 1,364 recorded remarks varied in length from 1–17 words, and their average length increased during the observations from 3·5 to 4·3 words. Many could be matched with the kernel sentences and the transformations of linguistic theory. Transformations were regarded as generalised if two or more underlying phrase structures were combined, and as singulary if only one phrase structure was involved. Katz and Postal (1964, p. 118) have shown how it is more satisfactory to regard all singulary transformations as operating on the underlying phrase structure, making negative, interrogative, imperative and passive forms similar to the corresponding active form, but not dependent upon it. Thus, a simple categorisation of syntactic structures was:

(1) Active kernel sentences.
(2) Other singulary structures.
(3) Generalised transformations.

Katz and Postal's scheme also allowed the allocation of less structured remarks, whether functionally complete or not, to the appropriate category of singulary transformations when they carried a relevant element, such as a negative, so it was possible to allocate all remarks within the three major categories

IV.—Results.

Active kernel-matched remarks.

Many remarks could be matched with sentences having immediate constituents of noun phrase and verb phrase, where these in turn contained further elements. Sentence patterns of this type, described by Cattell (1966), were matched in the collection of remarks, but within these structures both errors and omissions occurred. In some instances when the noun phrase was represented by a pronoun, it was omitted, especially in monologue when the child seemed to find it unnecessary to specify his own authorship of activity. In 76 strings of the pattern—*noun phrase+be+adj. or further noun phrase*, the main verb *be* was omitted from the verb phrase, although in other remarks it was included. The majority of omissions were of subordinate elements—articles in the noun phrase, and auxiliaries in the verb phrase ; but even these were being rectified towards the end of the period of observation, this accounting largely for the increased length of remarks. The process of developing the use of articles appeared to depend largely on the achievement of a better phonetic performance, enabling the child to pronounce *a* and *the* more distinctly ; and partly on an increased awareness of the difference between reference to a particular object and to one of many.

The development of the auxiliary was much more complicated and was related to the use of the transformations involved in Chomsky's rewrite rule of *aux*—C.M. (have +en) (be+ing) ; these transformations accounting for most of the grammatical errors as well as omissions. Examples were :

Error in C...... A police car go up there.
Error in M...... He be sick.
Error in (have-en) Mine gone up there. I been on a horse.
Error in (be-ing) I going on a horse. Mine coming.

In approximately 90 per cent of the remarks judged to be in the present tense the constituent verb was used unmodified and without an auxiliary. Thus, both the phrase structure constituent and the transformation were absent, but in the remaining 10 per cent (113 remarks) *ing* was used without an auxiliary in 81 cases and with it in only 32. The past tense element *en* was used less frequently, but it also occurred more often without than with the auxiliary In no case was an auxiliary used without the elements *ing* or *en* where appropriate, so it seemed that the hierarchically grouped constituents of linguistic theory were not completely represented ; and in some cases compulsory transformations seemed to be operating on non-developed constituents of the phrase structure grammar, unless one proposed that in some way the child knew that the auxiliary was necessary but failed to express it. It seemed much more realistic, in view of the omission and agreement errors, to suppose that the child was not aware of the importance, and perhaps even the existence of auxiliaries, until he needed to discriminate between persons and tenses, partly to meet the requirements of social speech and partly to express his growing conception of time.

Some kernel sentences in the grammar include another transformation, when a verb and particle are separated by a pronoun in the verb phrase constituent. 20 remarks matched this structure, as in *Now I lift it up*, and there were no errors. However, inspection of the parallel transformation using the noun, revealed 25 instances in all of which separation occurred. Thus there was no evidence that the child treated the two syntactic structures as separate cases. Moreover, they were similar at the surface level to the constituent structure wherein the verb phrase is composed of *verb+noun+prep.+noun*; and the actual verbs with particles used by the child were identical with the verbs and prepositions used in the latter form, e.g., *take off, put in, put on* ; so that it seemed likely that the child had generalised the separation rather than used separate rules Generalisation here connotes more than the contextual generalisation described by Braine (1963a). It appears to depend not on the child's perceptions of the relations between words, but on his perceptions of the relations between the situations in which they were used.

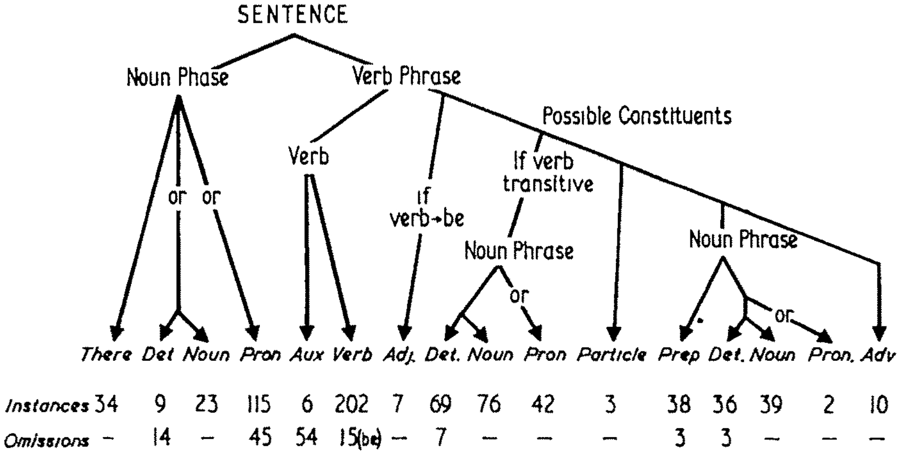
SENTENCE
Noun Phase
Verb Phrase
Possible Constituents
Verb
If verb transitive
if verb→be
Noun Phrase
Noun Phrase
or or
or
or
There Det Noun Pron Aux Verb Adj. Det. Noun Pron Particle Prep Det. Noun Pron. Adv
Instances 34 9 23 115 6 202 7 69 76 42 3 38 36 39 2 10
Omissions – 14 – 45 54 15(be) – 7 – – – 3 3 – – –

FIGURE 1

Summary of Kernel-Matched Remarks Observed in the First Month of the Study.

Variety in the remarks was achieved mainly in the predicate. Fig. 1 summarises the kernel-matched structures produced in the first month of the study, and shows clearly how the primary noun phrase and the verb were essentially each only one word; but the rest of the verb phrase was more varied, as though, having managed to convey the first constituents as concisely as possible, the child was then able to complete the sentence more freely without losing the thread. Although there were remarks with intransitive verbs which stopped short at the verb, there were others combining the different constituents shown in the figure, but only up to a maximum of two, when five words were achieved. Omissions in this part of the sentence were relatively few. It was noticed that some of the constituents occurred also as functionally incomplete remarks. The child appeared to have a repertoire of noun phrase, verb, prepositional phrase, adjective, and adverb, based on operational categories; and which he was able to arrange in sentence form according to his perceptions of a situation, and his acceptance of simple order used in the fragments of adult speech that he could understand. This was a development from the two word pivot-open type of remark described by Miller and Ervin (1964) and Braine (1963b), but the remarks had the same characteristics in constituent pivot-open patterning, e.g.:

noun phrase—verb
—adverb
—adjective
—prepositional phrase

verb—noun phrase
—particle
—prepositional phrase
—adverb

which, when put together produced a fragmentary hierarchical system. This pivot-open patterning is, of course, reminiscent of the complex organisation of children's collections described by Vygotsky (1962).

Perhaps the most interesting feature of the system is shown in Fig 2, where the positions of characteristically omitted elements are shown in a theoretical phrase-structure diagram. They are all first positions of binary divisions, and this suggests strongly that the hierarchical structure does not reflect some basic abstract linguistic competence, but the organising and processing capacity of a maturing cerebral system.

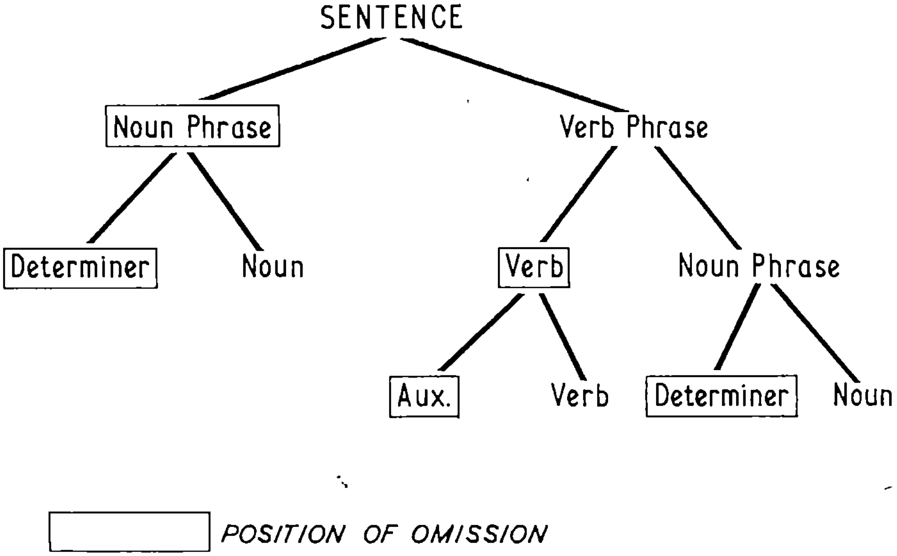

FIGURE 2

POSITIONS IN A PHRASE STRUCTURE DIAGRAM OF CONSTITUENTS MATCHED WITH OMISSIONS IN REMARKS.

Other singulary structures.

The negative, interrogative, and imperative remarks used in speech are characterised by intonational and expressional markers as well as the structural alterations of linguistic theory. These markers are demonstrated from the early neonatal days, and are certainly as old as the kernel sentences. They enable the hearer to assign the intended structure of the remark even though the verbal syntax is undeveloped.

In linguistic theory these transformations require the use of appropriate elements, at a particular point in relation to the ordered rewrite rules of the structure of the kernel sentence. Since the child's remarks only matched the kernel structure in a fragmentary manner, it was expected that the transformations would show similar features, and that errors would occur when the transforming process was related to under-developed elements of the kernel sentence. This was, in fact, so. However, the child was not prevented from attempting syntactic structures based on these transformation markers, and his attempts showed the development of separate patterns which would later be integrated more economically in his adult grammar.

In framing negative remarks, the child used patterns built round ***no***, ***n't***, and ***not***, each with characteristic errors. *No* was used as a functionally complete remark four times ; as an assertion strengthening a remark 11 times ; incorrectly for ***don't***, e.g., *No touch it*, eight times ; and incorrectly for ***not*** once, ‘ *I can no reach it*’ Its use was over-generalised. *N't* was correctly used with auxiliary and modal verbs in 46 remarks, but was associated with omission of noun phrase, *I*, or number agreement errors in a further 10 remarks. *Not* was absent from the first month's samples, but occurred increasingly in the second two months. It was used correctly only after *it's*, *I'm*, *that's*, and *he's* i.e., with no obvious enunciation of the verb *be*. It was used in ungrammatical remarks omitting the verb *be*, either as a main or an auxiliary verb, or omitting the transformation *do*, e.g., *I (am)not ready yet* ; *I (did) not drop it.*

The child's questions were matched with the *Yes No* (or *Tq*) question transformation and the *wh* transformation described by Chomsky. In spite of the theoretical dependence of the *wh* transformation on the *Tq* the child had difficulty in producing *Tq* matches, but achieved 45 *what, where, who,* and *why* remarks in the patterns *Wh+be+noun phrase* or *wh+aux+noun phrase+verb*; the only errors being eight omissions of the auxiliary. A striking feature of the use of *wh* was the similarity in surface structure with kernel sentences using introducers.

e.g.	There's a	Where's a .... ?
	That's a	What's a ....?

Their close association in dialogue suggested a means of learning *wh* usage quite separately from *Tq*, a means described by Brown (1968). In remarks matched with the *Tq* transformation, inversion occurred in only 11 instances, 10 of which occurred in the latter half of the observations and all of which were patterned around *can* or *be*. In 24 remarks there was a definite interrogative intonation cue, but no inversion, and in a further nine remarks kernel sentences were followed by an interrogative, usually with some redundancy, e.g., *I draw a brown car, shall I*? Imperative remarks were produced with comparative ease. The pronoun was retained when required for emphasis, and the negative *don't* was used. The child also managed to use *let* with the first person. The status of the imperative in linguistic theory is not clear, however, and the transformation appears to be complicated. Presumably the child's performance was so easily achieved because the surface structure of the sentences consisted of a few, very simple patterns.

This brief description of the negative, interrogative and imperative structures may be summarised by saying that they were characterised by incomplete kernel structure and by the use of a relatively small number of pivot-open patterns. As yet the child appeared to have neither an integrated hierarchical system of kernel sentence rules, nor an economical system of transformation rules.

There remains one other singulary transformation to be considered—the passive. This is unlike the others in that it is not associated in speech with similar functional expressive or intonational cues. It is a form which requires as a minimum the use of the auxiliary *be*, past participle of transitive verbs, and the transposition of the noun phrase subordinate to the verb phrase to the main noun phrase position. It has been seen that the child's speech showed underdeveloped use of the auxiliary *be*. Furthermore, he only used 18 suitable past participles, and with only three of these did transposition occur, e.g., *Dat's tangled*. In no case was the full passive used, reporting the agent. This is not surprising if one considers that a shift of attention from one subject to another is required. This shift has been referred to by Turner and Rommetveit (1968). The passive might better be regarded as a generalised transformation, especially since the child's tendency, observed outside the controlled recordings, was to say something like *Dat's tangled. He did it.*

Generalised transformations.

The child's recorded speech contained nine instances of conjunction, and 129 of some form of nominalising transformation, of which 71 were adjectival, adjective being defined as a non-verbal element which can take the position *adj.* in a sentence-*noun phrase+be+adj.*

Frequently these remarks showed errors if matched with terminal strings of generalised transformations. For instance, in *I know where's a car* the required structural change was not made. In *I go in lounge and in breakfast room, and go in front room, and go in hall* the difficulty experienced in combining more than two phrase structure systems was apparent. There was no conjunction in which two different immediate constituent noun phrases were combined with one verb phrase, although conjunction occurred both of two verb phrases and of two sub-ordinate noun phrases. This is interesting in that the passive requires the integration of two such noun phrase structures, though in a different manner; and the difficulty may be related to that illustrated in the problem of combining two judgments of the type required for the water-jar experiments originated by Piaget (1952, pp. 3-24). Other limitations in the production of remarks which could be matched with generalised transformations were that, except for the conjunction quoted above, which was produced under conditions of great excitement, no more than two phrase structure systems were combined, and many of the instances conformed to the patterns, *I want to+verb phrase, I like to+verb phrase. Look (or see) what+noun phrase+(verb+ing).*

Thus it appeared that, even at a complex level, variety in remarks was achieved in part through the use of pivot-open constructions, and that production was limited by some restricted organising ability of the brain.

Structure and the social setting.

Relationships were explored between the different social settings of the child's speech activity and the remarks produced. The findings are summarised in Table 1.

TABLE 1

THE DISTRIBUTION OF DIFFERENTLY STRUCTURED REMARKS BETWEEN THE THREE SOCIAL SITUATIONS.

Remark structure	Situation			
	Monologue	Social Monologue	Dialogue	Total
Sentence :				
Singulary Active	220	292	218	730
Transformed	83	191	132	406
Less than sentence .				
Complete simple	28	32	28	88
Complete transformed	2	7	18	27
Fragmentary simple	29	48	19	96
Fragmentary transformed	6	7	4	17
	368	577	419	1364

The total variation from the expected distribution of three equivalent samples was statistically significant, $\chi^{2(10)} = 37{\cdot}1$, $p < {\cdot}01$. The chief sources of variation were:

(*a*) Both types of social speech showed a higher proportion of transformed structures, with dialogue containing the highest proportion of functionally complete non-sentence remarks. This was to be expected in question and answer, and in argumentative exchange.

(*b*) Monologue showed a deficiency of transformed remarks, and both forms of monologue showed an excess of the fragmentary functionally incomplete remarks.

Dialogue appeared to require a clearer specification of reference.

The distribution of remarks within the transformed categories, expressed as percentages of remarks in each social category, is shown in Table 2.

TABLE 2

THE DISTRIBUTION OF TRANSFORMATION-MATCHED REMARKS WITHIN THE THREE SOCIAL SITUATIONS

Transformation	Percentage of total in each category		
	Monologue	Social Monologue	Dialogue
Generalised :			
Adjectival	5·4	5·5	4·7
Other	3·5	5·9	4·8
Interrogative :			
Wh	6·6	2·8	5·2
Tq	·1	3·1	4·0
Imperative	8·4	12·5	13·4
Negative	3·5	12·3	8·8
Total	27·5	42·1	40·9

The social situations gained the excess seen in Table 1, principally from the use of negative, *Tq*, and imperative structures. It would appear that the child was learning to use these forms in dialogue with his sister, in much the same way is Brown (1968) has described a child learning *Wh* structures in exchanges with his mother. Since it is in these exchanges that pronouns are specified more clearly, it is possible that ultimately the child learns to produce remarks correctly to match sentences with auxiliary and agreement transformations, through experience with dialogue.

Generalised transformations however, tended to be more equally distributed, the social situation holding a slight advantage from the repeated use of the formula *Look* (*see*) *what* .... Even in monologue the child attempted varied and complex productions.

Structure and activity setting.

The vocabulary list derived from the samples contained 423 words, almost all of which were used in reference to the child's immediate perceptions and activity. Moreover, the type of activity influenced certain aspects of structure. Adjectives, being principally of qualities of touch, size and colour, were found predominantly in association with manipulative play with small toys and with painting. Longer remarks and amount of speech, as measured by the number of words in a 10-minute sample, also seemed to be related to this type of play, as shown in Table 3, although the differences were not statistically significant.

Here is evidence which suggests strongly that the child's performance was not only dependent upon his verbal repertoire but also on his experience in the episode in which he used language. Without immediate adult influence he could only produce remarks arising from the integration of his ongoing actions and perceptions, together with the coinage of social exchange when required.

TABLE 3

TYPE OF ACTIVITY AND SPEECH STRUCTURE IN THE SAMPLES.

Structure index	Percentage of samples	
	Manipulative play	Other
Words per remark :		
2·5—2·9	5	7
3·0—3·4	5	32
3·5—3·9	39	36
4·0—4·4	26	18
4·5—4·9	24	7
Words per sample :		
<60	14	29
60—79	34	36
80—99	26	29
100—119	13	0
>120	13	6

His linguistic and cognitive competence were bound together, newly heard remarks bringing new words and directing attention to new perceptions, and activity providing the structure for the production of new remarks.

Patterning in the samples.

There is a sense in which, especially in monologue, the sequence of remarks may be taken to represent the child's 'train of thought,' or grasp of a theme. These sequences revealed key-ring, edge-matching and multiple grouping patterns like those described by Oliver and Hornsby (1966, p. 75), in work on children's cognitive development. Extracts from the samples below are analysed in Fig. 3.

I see that bus.
Bus stopped.

There's a horsey.
I been on a horsey.
I going on a horsey.

That your box.
It's yours.
It's your box.

Who's done this a car?
Broke.
A broke on a car.
Car-car on a train.
Pull my train.
Who done this to my train?

There's my lorry.
Lorry go knock down.
I gonna knock down.

A got a lulu (ball).
I can't make a lulu.
Hilary make a lulu.

I made a polish.
Where's a polish?
There's a polish.
I make a polish on the table.

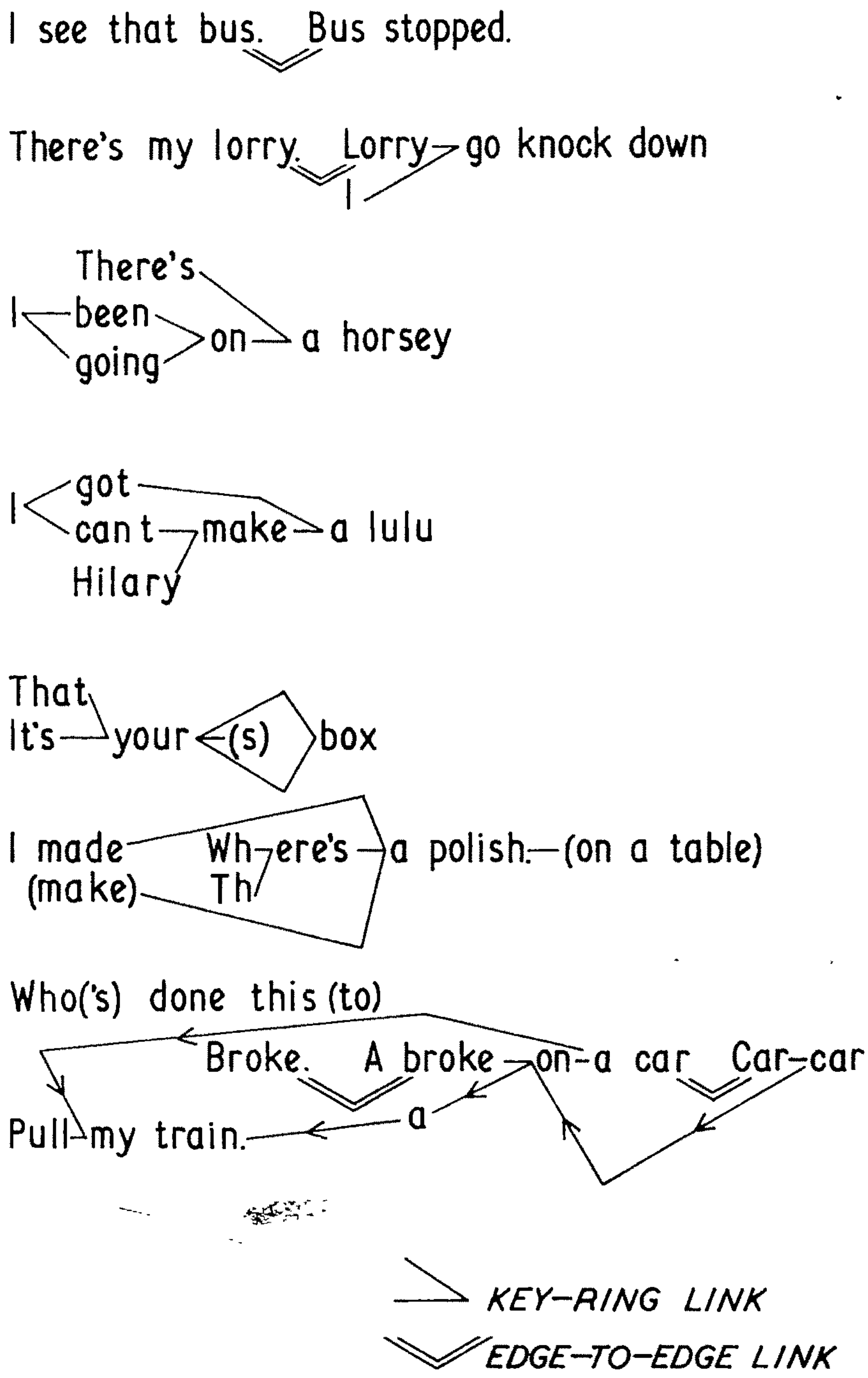

FIGURE 3

Some Complex Collection Patterns in Sequences of Remarks.

This is not the language of adult thematic expression, in which dependent elements are embedded in complex sentences, described so well as hierarchical generalised transformations by Katz and Postal (1964, p. 62). Thus in this way, too, the child's language seemed to reflect not only his actions and perceptions but also his cognitive ability.

V.—CONCLUSIONS.

Analysis of the remarks of a 2½-year-old showed that they could be matched with a wide range of syntactic structures, but that performance was limited in the following respects:

(1) Some features of the hierarchical structure of sentences described in linguistic theory were absent or under-developed in spite of the presence of dependent or subordinate constituents. The underlying structure appeared to be fragmentary rather than integrated.

(2) Within each remark type, when the actual words used were considered, a few pivot-open patterns predominated. These resembled the two word pivot-open patterns described by Braine as characteristic of a younger child's speech. They also resembled the key-ring organisation of children's collections.

(3) Some remarks matched the structure of generalised transformations, but these were restricted to combinations of two kernel sentence units, and then only when the units shared the same immediate constituent noun phrase.

(4) The structure used by the child depended on the social and activity setting. Productions were novel, but not free.

(5) Collection of remarks made on any one occasion did not show the super-ordinate relationships of adult language, but featured the key-ring and edge-to-edge patterning of young children.

VI.—DISCUSSION.

The possibility is, therefore, discussed that children's language competence shows deep structure features, not of the integrated hierarchical ordering of linguistic theory, but of the fragmentary, partially hierarchical organisation of their cognitive experience.

The theory of generative grammar still being elaborated from the basic work of Zellig Harris and Noam Chomsky has provided linguists with a powerful analytic tool. Discussion of the nature of acquisition of language has been influenced by it to the extent that the child's ability to produce a variety of remarks of an original nature has been said by McNeill (1966) to be explicable only in terms of a built-in language acquisition device, which operates to analyse, compare, and produce structures related to each other in the hierarchical manner of linguistic theory. This has led to the proposal by Bruner (1966, p. 43) that the child's linguistic competence is in some way superior to his general cognitive competence. However, it has been suggested in this paper that a careful analysis of the patterning of children's remarks in relation to the episodes of use might reveal modes of generation of original language which are characteristic of cognitive competence.

A child's experience consists of many, many episodes in which the maturing biological organisation of his body intersects with the patterned physical and social world, and each time he gleans a little more pattern and adds a little more, thus both learning from life and making his own impact. Given, at any stage, his tendency to make binary decisions and his limited immediate memory store, it seems likely that his language activity will show some similarity to Yngve's (1960) model, but his permanent store of patterns for comparative analysis will hold only those patterns which are useful and meaningful to him.

As with perceiving, imagining and thinking there must, therefore, be some procedures in the system by which the child can add new patterns, re-design more economically those already there, and venture to experiment with his repertoire to produce new designs. There is, however, no reason to suppose that language processing is a separate function from general cognitive activity, although experiments on machine processing of language may tempt one to do so. Man most probably evolved as a talking creature, and children grow up talking.

When he is not talking with adults, a child reflects in his speech his own mode of operating in the world, although he may at times repeat well-rehearsed items of songs, rhymes and snatches of adult language. Exposure to more adult speech, however, presents him with the opportunity of acquiring a little more than he expects or understands, and if the heard remark refers to ongoing, meaningful activity then the little extra may be attended to, considered and eventually tried out to see what happens. Slowly the child adds to his repertoire, not using simply the syntax of language, but what might be called the syntax of experience of the relations between his functioning brain and body and the rest of the world. This underlying syntax, discussed by Meredith (1966, p. 387) must first be understood before the syntax of language can be explained as well as described. The hierarchical features described by linguists are no more than the organisation imposed on language, through the centuries, by the operations of intelligent adults. Children impose their own patterns upon it, and in so far as their cognitive organisation is an immature, fragmentary form of the adult's, so is their language.

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RESEARCH NOTES

A FOLLOW-UP OF CHILDREN IN THE FIRST i.t.a. EXPERIMENT

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Summary. Two follow-up tests (in T.O.) were administered to pupils in the original i.t.a experiment; the NFER Sentence Reading Test 1 (silent reading comprehension) at the beginning of the fifth year of school, and the NFER English Progress Test B at the end of the fifth year. The superiority of the i.t.a. group at the end of the third year which was reported in *The i t.a. Symposium*, was maintained in both these tests in the fifth year It seems possible that these experimental group subjects have developed an understanding of the structure of English which they are using to map the more complex T.O code.

I.—Method.

Since Downing (1967) published the results of the original experiment with the Initial Teaching Alphabet (i.t.a.) which began in 1961, two further tests have been administered to experimental (i.t.a.) and control (T.O.—traditional orthography) group subjects during their fifth year at school. These follow-up tests were the NFER Sentence Reading Test 1, a group test of silent reading comprehension administered in the 13th school term, i.e., at the beginning of the fifth year, and the NFER English Progress Test B administered in the 15th term, i.e., at the end of the fifth year. This test is described by the manual as having " been constructed for the purpose of estimating the progress made by 9-year-old children in the use of English. It provides a representative selection of tasks in which the vocabulary, reading comprehension, expression, grammatical usage and spelling to be expected from a 9-year-old child is tested." Both tests were administered in T.O. to all subjects.

The number of subjects in each group was quite small; 78 for the Sentence Reading Test and 92 for the other test. This was due to the fact that only those subjects recruited in the first year of the experiment were available, and through the usual problems of mobility, and wastage after between four and five years of a longitudinal study.

The procedure for matching the experimental and control groups was the same as that used for the earlier tests. This has been described in detail in the book by Downing referred to above.

Briefly, in the present two tests, following the same procedure, the experimental and control groups were satisfactorily matched on urban/rural location, infant/infant junior organization, age, sex, social class, score on Raven's (1947) Coloured Progressive Matrices and score on Raven's (1950) Crichton Vocabulary Scale. However, the control group were significantly different from the experimental group in respect of three background variables. The control group tended to be from larger schools, but they had superior amenities on Morris's (1959) schedule of features of school buildings and the control pupils were in smaller classes. Thus the possible bias seems likely to favour the control group on two variables, and the experimental group on one.

TABLE 1

Silent Reading Comprehension of i.t.a. and T.O. Pupils at the Beginning of the Fifth Year of School. Both Groups Tested on the T.O. Form of the NFER Sentence Reading Test 1.

	Experimental (i.t.a.) Group	Control (T.O.) Group
N	78	78
Mean	22·42	16·92

Difference significant at 0·1 per cent level using Kolmogorov-Smirnov (one-tailed) test. D.Max$=0·3205$ $\chi^2=16·02$.

TABLE 2

Attainments in English of i.t.a. and T.O. Pupils at the end of the Fifth Year of School. Both Groups Tested on the T.O Form of the NFER English Progress Test B.

	Mean Score		Per cent level of significance of difference	Kolmogorov-Smirnov (one-tailed test)	
	Experimental (i.t.a.) Group (N=92)	Control (T.O.) Group (N=92)		D.Max.	χ^2
Full test	28·14	19·07	0·1	0·2934	15·84
Sub-test:					
1. Capital Letters ...	4·91	3·38	5·0	0·2175	8·70
2. Story Comprehension	4·76	3·87	1·0	0·2283	9·59
3. Past and Present Tenses	3·91	2·13	0·1	0·2935	15·85
4. Spelling	2·47	1·43	1·0	0·2391	10·52
5. Sentence Completion	7·62	5·48	0·1	0·2935	15·85
6. Abbreviation	4·37	2·35	1·0	0·2610	12·53

II.—RESULTS.

The treatment of results was the same as that used previously in Downing's *Evaluating the Initial Teaching Alphabet*, and in *The i.t.a. Symposium* of Downing, *et al.* (1967). This method has been used again to maintain continuity in the reporting of this experiment. However, in view of comments by Burt (1967) on the statistical treatment of the previous results of this experiment, the differences have been tested also by a one-tailed t test. All remain significant at at least the 5 per cent level. On Sub-Tests 3, 4 and 6 of the English Progress Test B, the differences are significant at the 1 per cent level Thus, by either treatment, the experimental group's scores on both attainment tests were significantly superior to those of the control group. Also, the same is true of all six of the Sub-Tests in the English Progress Test, i.e., capital letters, story comprehension, past and present tenses, spelling, sentence completion, abbreviation.

III.—DISCUSSION.

Within the limits of the populations of this particular experiment, these results indicate that the superiority in T.O. reading and T.O. spelling achieved by i.t.a. pupils by the end of the third year, as reported earlier by Downing, is afterwards maintained until at least the end of the fifth year. Also, it seems that the superiority of the i.t.a. pupils extends over a range of skills in the 'use of English' (T.O.).

The fact that the i.t.a. subjects in this experiment continue to show superior achievements in T.O. raises interesting theoretical questions regarding the transfer of learning from i.t.a. training to T.O. reading and spelling. It seems possible that these children's concrete experiences with i.t.a.'s simpler and more regular writing-system have facilitated the understanding of the structure of English. The resulting frame of reference is then used to map the more complex T.O. code.

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AN OBJECTIVE METHOD FOR DETERMINING THE REGION OF THE PASS/FAIL CUTTING POINT IN UNIVERSITY EXAMINATIONS*

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In a recent work Parkyn (1967) showed that by utilising data on reliability a pass/fail cutting point could be established, in a range of scores, which took account of fluctuations in test results that came from sources unrelated to the candidates' knowledge of the subjects on which they were being examined. While this approach reduces the degree to which candidates are penalised by artefacts of the examination process, it does so at the expense of the examiner's control in setting the standard. By substituting validity data for reliability data the method to be proposed here largely takes account of the effects of unreliability and also enables the examiner to exercise informed control over the degree to which this provision will be reflected by changes in the standard.

From the discussion below it can be seen that the validity coefficient subsumes the properties of the reliability value; and, in addition, it contributes unique features of its own In summary the most important aspects of this relationship are as follows :

(1) The reliability value places a maximum limit upon the value of the validity, but does not restrict its minimum value. This maximum limit varies according to whether the validation criterion is perfect or imperfect. Thus, when the criterion is perfect the maximum possible validity is less than or equal to the square root of the reliability value. When the criterion is imperfect the maximum possible validity is less than or equal to the reliability coefficient (McNemar, 1962).

(2) Conversely, validity implies a minimum value of reliability. Thus, when the criterion is perfect the minimum value of the reliability is greater than or equal to the validity; and when the criterion is imperfect the minimum reliability value is greater than or equal to the square of the validity coefficient.

(3) Furthermore, this relationship is not reciprocal, in that validity always fixes a minimum reliability value but reliability in no way implies a minimum of validity. For example, in the case of an imperfect validation criterion, if the validity is 0·80 then the reliability is at least 0·64 ; however, a reliability of 0·64 implies nothing about the validity.

The above discussion indicates that a strategy based on reliability is unlikely to be as comprehensive as one based on validity. But, while it is relatively easy to find the reliability of a university examination, ascertaining the validity poses somewhat more of a problem. Correlating students' results for the first and second years, however, produces a sufficient measure of congruent validity for the first-year examination provided certain corrections are carried out. As the approach to be employed here depends on the correlation being obtained from normally distributed data, and data from university examinations are seldom distributed normally, it is necessary, first, to transform the distributions of results into a normal form. The arc-sine transformation using ranks is quite appropriate for this purpose (Walker and Lev, 1953). However, the correlation between first and second year results applies only to those students who proceeded to the second year and does not take account of those who were prevented from going to the higher stage by virtue of their failure in the first year. This phenomenon is termed 'explicit selection' and Gulliksen (1951) has demonstrated that the effects of this may be corrected for, so that an estimate can be made of the likely correlation between first and second year results had all first-year students been allowed to proceed to the second year.

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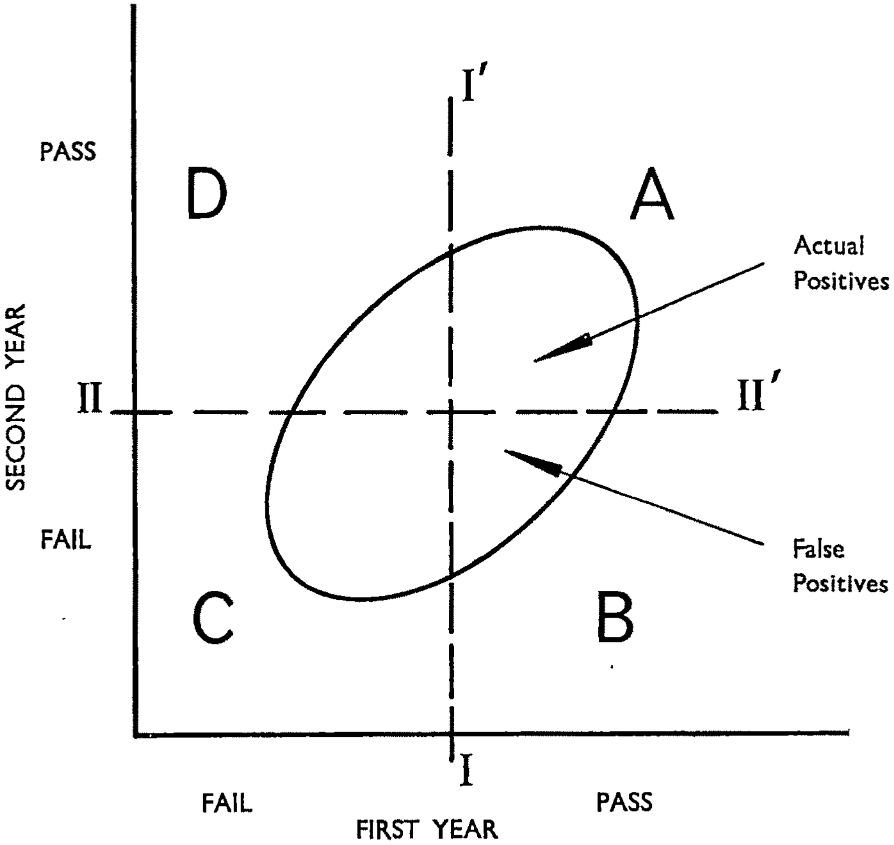
* This paper was originally given in an extended form at the 1968 Conference of the New Zealand Statistical Association.

This corrected validity coefficient now conforms to the requirements of the Taylor-Russell prediction tables (1939) and so enables the strategy employed by them to be utilised for the present problem. These tables are simply based on Pearson's (1931) tables of volumes of normal bivariate surfaces with different levels of association. The application of the tables in the present context may be illustrated through Figure 1.

FIGURE 1

Representation of a Normal Bivariate Correlation Surface from Marks of the Same Individuals for Two Consecutive Years.



In Figure 1 the correlation surface is represented by an ellipse intersected by the first and second year pass/fail cutting lines (I, I′ and II, II′ respectively) which separate the surface into the quadrants A, B, C, D.

Quadrant A represents those who passed the first year (P_1) examination, and also passed in the second year (P_2) (actual positives).

Quadrant B represents those who passed in the first year (P_1) but went on and failed in the second year (F_2) (false positives).

Quadrant C represents those who failed in the first year (F_1) and would also have failed in the second year (F_2) had they been permitted to proceed to the second year.

Quadrant D represents those who failed in the first year (F_1) but would have passed in the second year (P_2) had they been allowed to proceed to it.

Axes I, I′ and II, II′ may be varied; and the Taylor-Russell Tables show the redistribution in percentages, of the volumes in the quadrants, for different degrees of variation in the first-year pass rate according to the size of the validity coefficient and the pass rate for the second year.

Ideally, in terms of Figure 1, the examiner needs to be able to locate the point in the distribution that will yield a minimum of false positives (P_1F_2) for a maximum of actual positives (P_1P_2). Obviously, the choice of this point is not clear-cut as it contains an element of conflict, for an increase in the number of actual positives (P_1P_2) will be accompanied always by an increase in the number of false positives (P_1F_2). Similarly, a decrease in the number of false positives (P_1F_2) will be accompanied by a decrease in the number of actual positives (P_1P_2). The exact ratio of false (P_1F_2) to actual positives (P_1P_2) that determines this optimum point is, therefore, a matter of personal preference and must be decided by the examiner.

Thus, the present strategy demonstrates for the examiner the range of ratios of false (P_1F_2) to actual positives (P_1P_2) in any given situation, and when the examiner has chosen a particular ratio the method specifies the pass rate he must set to achieve that result. The following examples serve to illustrate some aspects of the method.

Two examples, X and Y, show the same pass rate of 75% for the second year of the previous intake; that is, A/A+B+C+D (in Figure 1) equals 75%. X has a validity of 0·90 while the validity of Y is 0·80. It is also necessary to know A+D/A+B+C+D (in Figure 1).

This last value is found by using the entries in the body of the Taylor-Russell Tables. A+D is found when division into the given A by an entry in the row for the given validity coefficient produces the A+D value at the head of that particular table. As the values for A+D are given in steps of 10% some interpolation may be necessary.

With the above information the Taylor-Russell Tables may then be used in the conventional way to produce the entries recorded in Table 1.

TABLE 1

SELECTION OUTCOMES FOR VARIOUS PASS RATES GIVEN TWO DIFFERENT VALIDITIES.

First Year Pass Rate*	60%		70%		80%	
Positives :	Actual	False	Actual	False	Actual	False
Example X (V=0·90)....	59·4	0·6	67·9	2·1	75·2	4·8
Example Y (V=0·80)....	57·6	2·4	65·8	4·2	72·8	7·2

* Second-year pass rate 75 % for both examples.

In example X, with a validity of 0·90, a cutting point of 60% rather than 70% would be expensive in terms of the 8·5% actual positives (P_1P_2) lost for the 1·5% false positives (P_1F_2) saved—a ratio of these actual to false positives (P_1P_2 to P_1F_2) of 5·7 to 1. Setting the cutting point beyond 80%, however, would mean a saving of another 7·3% of actual positives (P_1P_2) but at the cost of 2·7% false positives (P_1F_2), a considerably reduced ratio of additional actual positives to additional false positives (P_1P_2 to P_1F_2) of 2·7 to 1. For an optimal result and maximum economy the cutting point would be best placed in the region around 70% to 80%. This would produce a fairly small percentage of false positives (P_1F_2), and these may be justified by considering them as genuinely marginal passes; that is, cases with just enough ability to pass in the first year but insufficient to sustain a pass in the second year.

It can be seen that for Example Y, with a validity of 0·80, a cutting point of 80% would achieve almost as many actual positives (P_1P_2) as for Example X, at the same point, but at the cost of twice as many false positives (P_1F_2). Unlike Example X, therefore, the optimum point is more likely to be in the region around 60% to 70%.

An annual assessment of the correlation between first and second-year results is necessary for the proper working of this system, and the use of control charts to observe the nature of trends, over a number of years, is a desirable adjunct to the system proposed here.

To most readers it will be obvious that the proposed system depends on the suitability of the second-year results as a criterion for first-year validity. The consideration that the aptitudes required will be largely the same, for success within two consecutive years of a subject, favours this assumption. Where obviously different skills are required account should be taken of this in deciding the degree of weight to be placed on this scheme.

The rationale implicit in the approach suggested above is that consistency should exist between examining standards at the first and second years. It proposes that if the mechanics of the relationship between first and second year results are elaborated within a known structure and in sufficient detail, then the examiner will have information that enables him to achieve results closer to his ideal than those allowed by the alternative methods available at present.

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LONGITUDINAL USE OF A STUDENT-CONSTRUCTED TEACHER EVALUATION FORM

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SUMMARY. A simple teacher evaluation form was developed from variables used by students when considering teachers. Results indicated consensus amongst a large group of students about teacher strengths and weaknesses. Similar profiles emerged over each of three years, but median ratings indicated an overall improvement in performance. Profiles were shown to discriminate between different lecturers.

I.—INTRODUCTION.

A generally accepted principle of educational psychology is that knowledge of results can lead to improved performance, but few university teachers regularly put this principle into practice in respect of their own teaching performance. A very small minority of the published studies of teacher evaluation involve evaluation by students. Yet students are in a unique position to evaluate, and most students do pass judgments on teachers' performance. These judgments are occasionally published by student newspapers, or communicated to the lecturer concerned via a third party, such as research students (who have a foot in both camps). The literature on formal teacher evaluation by students has been reviewed by McKeachie (1965).

In these studies, the scales or variables used for rating are generally supplied to the students by the lecturer concerned, or by an outside expert. Although any feedback is better than none, it is possible that the variables considered as important by the lecturer are not those so considered by the students. The rating may thus be biased by the lecturer's preconceptions. This point was demonstrated in a study by Bloom, Dunn and Morse (1964) which showed little agreement between pupils, teachers and observers in their evaluation of teaching situations. It would be possible to ask the student to state how important he considered each variable at the same time as using the variables to rate his lecturer, but such a procedure would be time-consuming.

An alternative approach is to ask students to generate their own rating scales. This was done by using a development of the Role Construct Repertory Test (Kelly, 1955).

II.—METHOD.

Students were asked to list nine lecturers and tutors with whom they had personally studied in the current year. This list was kept by the students and not revealed to the investigator, who referred to the teachers by number. The students were asked to concentrate upon teachers numbered 1, 2 and 3; and considering their behaviour as teachers to think of a bipolar scale such that two would be placed at one end and the third at the other end. This procedure was repeated for all combinations of three from the list of nine, ensuring that no two teachers were considered together in a triad more than once (i.e., 12 replications). Each student formed a grid with the 12 scales so generated down the side and the reference numbers of the nine teachers along the top (Table 1). Each teacher was then rated along each scale, and those judged to manifest the behaviour described by the end of the scale shown were marked by a cross in the appropriate cell. If the scale was considered inappropriate for a teacher he was marked by a circle.

TABLE 1

REPERTORY GRID OF TEACHER BEHAVIOUR.

	1	2	3	4	5	6	7	8	9
Can hear him	X		X	X	X			X	X
Interesting		X	X		X	X		X	
Sets work regularly	O		X	X		X	X	O	
Smokes in class		X		O	X	X			X
Plans the lecture	X		X	X			X		
Respects students		X	X			X		X	X
Socialist		X	O	X	X	O			
Able to explain	X		X	X		X		O	
Athletic	X		O	X					X
Good examples			X		X	X		X	
Gesticulates		X		X			X		
Shows applications of subject		X	X		X	X			X

A content analysis of the grids revealed 10 variables which were frequently used (by more than 50 per cent of the students to describe more than 50 per cent of the teachers), together with many variables which were idiosyncratic to one respondent or one teacher. The 10 variables were used to develop an evaluation form (Table 2).

The form was given to students at the last meeting in 1966 of a first year introductory psychology course. They were asked to complete it anonymously, giving details only of their department and chosen area of specialisation for years two and three. In addition, they were asked to specify those parts of the course which they had most and least enjoyed, and to be as frank as possible in further comments and suggestions for the improvement of the course in the future.

III.—RESULTS.

(i) *Rating Scales.*

One method of assessing the reliability of the scales would be to compare the ' scores ' given by the different ' judges ' (students). These scores would have to be consistent for the scale to be of any use. This comparison would require the computation of inter-judge correlations for all the 10 scales but, as the student group numbered over 100, this was computationally too arduous. The alternative approach adopted was to divide the forms into nine groups on the basis of the students' expressed specialisation for years 2 and 3. For each group the median rating on each of the 10 scales was computed, and the medians for each group of students were then put into rank order. This indicated the relative strengths and weaknesses of the lecturer as judged by nine homogeneous groups of students (Table 3).

An index of agreement amongst the nine rank orderings—Kendall's W—(Siegel, 1956) indicated a very high level of agreement that this lecturer's strengths were variables E, B and F (' Presentation,' ' General Interest ' and ' Clarity of Expression ') whilst his weaknesses were variables C, J and G (' Practical use,'

TABLE 2

Evaluation Form.

Department ....

Option........................ ... .

Most interesting part of course

Least interesting part of course

RATING : Please mark the appropriate spaces.

	Low			Moderate			High
A. Overall impression of this course							
B. General interest							
C. Practical use..............							
D. Lecturer's organisation of content							
E. Presentation..............							
F. Clarity of expression							
G. Organisation of time							
H. Choice of examples							
J. Attitude to students							
K. General manner							

Additional comments—how could the course be improved ?

TABLE 3

Rank Order of 10 Variables by 9 Groups.

	A	B	C	D	E	F	G	H	J	K
Group 1	3	8	2	9	7	10	6	5	1	4
Group 2	6·5	8	1	10	9	6·5	5	4	2	3
Group 3	7·5	10	2	7·5	9	5	4	6	1	3
Group 4	6	5	1	3	10	9	4	7	2	8
Group 5	8	10	1	7	9	5·5	5·5	4	2	3
Group 6	7	7	1	9	10	7	4·5	3	2	4·5
Group 7	10	8·5	1	7	8·5	6	2·5	4	2·5	5
Group 8	7	9·5	1	5	9·5	8	2	3	4	6
Group 9	9	8	3	6·5	6·5	10	4	5	1	2

'Attitude to students ' and ' Organisation of time ') The low rating on his attitude to students came as a shock to the lecturer who had tried to ' get to their level.' He had obviously failed in this respect, and an analysis of the students' spontaneous comments indicated why. Over 50 per cent mentioned his sarcasm and ' pathetic attempts at humour.'

(ii) *Spontaneous comments.*

All the comments and suggestions were carefully considered by the lecturer to get specific examples of features in his behaviour which could be improved. Resilience was necessary when considering these comments, since some apparently mild statements can indicate a total failure of communication. For example, in his course he had attempted to show the general relevance of psychology in many areas of life. The comment of one student : " The course was interesting, but I'm going to be a teacher and I can't see how psychology can be of any use to me," came as a bitter blow.

In the following year's lecture course, special attention was devoted to the weak points indicated by these results.

IV.—LONGITUDINAL STUDY.

The same form was completed by equivalent groups of students at the end of 1967 and 1968 academic years. Similar results were obtained (W= ·59 and ·50 respectively). The consistency of these results over the three years shows that the profile of a lecturer's performance remains stable even when obtained from different students. The median scores given by the whole group in each of the three years show that, although attitude to students remained a relatively weak point, the median score on this variable improved dramatically (from 3·82 to 5·47)—see Table 4. Furthermore, the table shows an overall improvement, since all the 1968 medians are higher than the equivalent values in 1966.

TABLE 4

MEDIAN SCORES FOR THREE YEARS.

	A	B	C	D	E	F	G	H	J	K
1966	5·33	5·52	3·91	5·43	5·51	5·33	4·78	4·71	3·82	4·61
1967	5·64	5·29	4·06	5·75	5·64	5·84	5·04	4·94	5·00	4·92
1968	5·68	5·59	4·26	5·87	5·72	5·72	5·41	5·60	5·47	5·43

V.—DISCUSSION.

In view of the consistency of scores over time, it could be argued that this scale only reflects student prejudices about lecturers, particularly since the variables were originally obtained from students. If this were correct, a similar pattern of scores would be obtained by other lecturers, irrespective of their actual behaviour.

Another lecturer, teaching a different subject to this group, used the scale to check this hypothesis. He also obtained a high W (·67) but with an entirely different pattern of strengths (variables H, D and G) and weaknesses (variables K, E and F), and different median scores. The Kendall rank order correlation between the two lecturers' scores for the whole group was –0·02 (not significantly different from zero). Thus, the student ratings do appear to discriminate between different lecturers' behaviour.

It seems reasonable to assert that student evaluation provides a reliable index of a teacher's performance. It is valuable in providing in a standard form a statement of strengths and weaknesses, together with specific examples of these showing where attention is required. Furthermore, it is welcomed by students as an attempt to improve the standard of teaching, and could possibly be justified solely on the grounds of providing a safety valve.

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MULTIPLE MARKING : WISEMAN OR COX ?

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I.—Introduction.

Twenty years ago, Wiseman (1949) proposed that the principle of replication should be employed to reduce the notorious unreliability of essay marking. Several markers should each assess independently the essays in question. These independent assessments should then be totalled (or averaged) for each essay, and the totals (or averages) taken to represent the relative merits of the essays. Wiseman showed that by using up to six markers in this way, mark re-mark reliabilities could be achieved which approached (though did not reach) the limit of unity to be expected with a test designed for objective scoring.

Recently, Cox (1968) has criticised the use of several markers in this way, on the ground that reliability may be increased at the expense of meaning: " The improvement does not represent greater agreement on the value of the essays, it is merely a device for getting the same mark each time " (page 8).

The purpose of this brief article is to look into the question of whether Cox's criticism has substance, and, if so, in what circumstances.

II.—Use of the pooling square.

Suppose p markers, a, b, …., i, j, …. p each independently assess the same set of n scripts on each of two occasions, O and O′. The nomenclature used is as follows :

r_{ij} is the correlation between markers i and j on occasion O ; $r_{i'j'}$ is that between markers i and j on occasion O′ ; $r_{ij'}$ that between markers i and j on occasions O and O′ respectively ; and $r_{ii'}$ the correlation (' self-consistency ') for marker i on occasions O and O′.

It is assumed that all markers spread their marks to the same extent.

Application of the pooling square then shows that the correlation $r_{TT'}$ between marker totals on the two occasions is given by

$$r_{TT'} = \left(\sum_{i,i'} r_{ii'} + \sum_{i,j'} r_{ij'}\right) \Big/ \sqrt{\left(p + \sum_{i,j} r_{ij}\right)\left(p + \sum_{i,j'} r_{ij'}\right)} \quad \ldots\ldots\ldots(1)$$

$$i, i' = 1, 2, \ldots., p\,;\ j, j' = 1, 2, \ldots.\ p\,;\ i, i' \neq j, j')$$

Making the reasonable assumption that on the average $\bar{r}_{ij}=\bar{r}_{i'j'}$, we may re-write equation (1) in terms of averages as follows:

$$r_{TT'}=\left(\bar{r}_{ii'}+(p-1)\bar{r}_{ij'}\right)\Big/\left(1+(p-1)\bar{r}_{ij}\right)\ \ldots\ldots\ldots\ldots(2)$$

We next examine the implications for equation (2) of two different situations. *Situation A*: The markers are highly self-consistent, and at the same time each agrees poorly with every other.

This situation corresponds to a high value of $\bar{r}_{ii'}$ accompanied by low values of $\bar{r}_{ij}$ and $\bar{r}_{ij'}$. In the extreme case of complete disagreement among markers, $\bar{r}_{ij}=\bar{r}_{ij'}=0$. If this should happen, then, as equation (2) shows, $r_{TT'}=\bar{r}_{ii'}$. Thus (i) the overall mark re-mark reliability is the mean 'self-consistency' of the markers and (ii) an increase in the number of markers does not enhance the reliability.

Situation B: There is some measure of agreement among individual markers about the merits of the scripts.

In this situation, as equation (2) shows, the magnitude of $r_{TT'}$ increases as p increases. In the limit, as $p\rightarrow\infty$, $r_{TT'}\rightarrow\bar{r}_{ij'}/\bar{r}_{ij}$. Thus increase in the number of markers (i) builds on the individual agreements among different markers, and (ii) reduces the relative effect of the markers' self-consistencies.

III.—USE OF VARIANCE COMPONENTS.

The matter may be probed more deeply by expressing the above coefficients in terms of components of variance (2). An appropriate statistical model to serve as a starting point is:

$$x_{cmo}=\alpha+\beta_c+\gamma_m+\delta_o+\beta\gamma_{cm}+\beta\delta_{co}+\gamma\delta_{mo}+\beta\gamma\delta_{cmo}$$

In this model, α is the general mean; β_c the contribution specific to child (or essay) c; γ_m the contribution specific to marker m; δ_o the contribution specific to occasion o; the next three terms are first-order interactions; and the last term is a second-order interaction. ($c=1, 2, \ldots, n$; $m=1, 2, \ldots, p$; $o=1, 2, \ldots, q$).

Making the usual assumptions about independence, etc., we may write the following expectations which are tabulated alongside the corresponding correlations in the pooling-square development:

	Correlation	Expectation
(i)	$\bar{r}_{ij}$	$(\sigma^2_{\beta}+\sigma^2_{\beta\delta})/(\sigma^2_{\beta}+\sigma^2_{\beta\gamma}+\sigma^2_{\beta\delta}+\sigma^2_{\beta\gamma\delta})$
(ii)	$\bar{r}_{ij'}$	$\sigma^2_{\beta}/(\sigma^2_{\beta}+\sigma^2_{\beta\gamma}+\sigma^2_{\beta\delta}+\sigma^2_{\beta\gamma\delta})$
(iii)	$\bar{r}_{ii'}$	$(\sigma^2_{\beta}+\sigma^2_{\beta\gamma})/(\sigma^2_{\beta}+\sigma^2_{\beta\gamma}+\sigma^2_{\beta\delta}+\sigma^2_{\beta\gamma\delta})$
(iv)	$r_{TT'}$	$(p\sigma^2_{\beta}+\sigma^2_{\beta\gamma})/(p\sigma^2_{\beta}+\sigma^2_{\beta\gamma}+p\sigma^2_{\beta\delta}+\sigma^2_{\beta\gamma\delta})$

We now re-consider Situations A and B in the light of these expectations.

In Situation A, $\bar{r}_{ij}$ and $\bar{r}_{ij'}$ were small (or vanishing) while $\bar{r}_{ii'}$ was high. The extreme case, in which $\bar{r}_{ij}=\bar{r}_{ij'}=0$, corresponds to $\sigma^2_{\beta}=\sigma^2_{\beta\delta}=0$, as the expectations in (i) and (ii) above show. Substituting these zero values in expectations (iii) and (iv), we obtain

$$\bar{r}_{ii'} = r_{TT'} = \sigma^2_{\beta\gamma} / (\sigma^2_{\beta\gamma} + \sigma^2_{\beta\gamma\delta}) \ldots\ldots\ldots\ldots (3)$$

This result throws further light on the structure of $\bar{r}_{ii'}$ and $r_{TT'}$ in the extreme case when the markers disagree completely with each other. In this case, as equation (3) shows, the component σ^2_{β}, which relates to real differences among essays simply does not appear. It follows that $r_{ii'}$ and $r_{TT'}$ are independent of, and hence unaffected by, such differences in the *real* merits of the essays as may be presumed to exist. More specifically, $\bar{r}_{ii'}$ and $r_{TT'}$ are the reliabilities of the *differences* between markers from one occasion to another, and hence indicate nothing more than the obstinacy with which each marker maintains his own judgments. In this extreme case, Cox is right; such reliability as is achieved tells us something about the persistence of the markers but nothing whatever about the quality of the essays they are marking.

We turn next to Situation B in which some degree of correspondence among individual markers was envisaged. The expectation in (ii) for $\bar{r}_{ij'}$ shows the presence in the numerator of the component σ^2_{β}, all-important as a measure of real differences among essays. Moreover, the expectation in (iv) for $r_{TT'}$ shows exactly how $r_{TT'}$ builds up as p, the number of markers, increases. As it does so, the effect of $\sigma^2_{\beta\delta}$, the discrepancies among markers, becomes progressively less, and in the limit, as $p \rightarrow \infty$, it disappears entirely and $r_{TT'} \rightarrow \sigma^2_{\beta} / (\sigma^2_{\beta} + \sigma^2_{\beta\delta})$. In this situation, Wiseman is right; increase in the number of markers attenuates the effect of markers' personal idiosyncracies and enhances the precision with which differences in the real merits of the essays are observed.

IV.—SUMMARY.

The method of multiple marking suggested by Wiseman to increase the reliability of marking essays has been criticised recently by Cox, who doubted whether the increase in reliability so obtained had any meaning in regard to real differences in the qualities of the essays.

There is some substance to this criticism if each marker is highly self-consistent and if at the same time each agrees poorly with every other. Under these conditions, the mark re-mark reliability of the total (or average) of them all will be both positive and high. But this correspondence will be largely independent of the real differences which presumably exist in the merits of the essays. Instead, it will express the obstinacy with which each marker maintains his own judgments, a reflection of enduring personal idiosyncrasies, an agreement to disagree.

If, on the other hand, there is a fair measure of agreement among individual markers about the scripts' merits, the aggregated marks from a team of markers will be a valid expression of the team's consensus of opinion, the reliability of which will increase as the size of the team increases. In this case, Wiseman's procedure is unobjectionable and Cox's criticism is invalid.

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AN INVESTIGATION INTO MARKING ART EXAMINATIONS

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SUMMARY. Fifty still-life paintings of the kind required for the compulsory section of the art examination for the Scottish Certificate of Education (the secondary school leaving examination) were marked by 10 art teachers (expert markers) and by 10 adults not qualified in art. Correlation between the number of times a painting was rated as ' pass ' by experts and by non-experts was high. However, only three paintings were rated as ' pass ' and 10 as ' fail ' by all 10 experts. The distinguishing feature between the passes and the fails was the degree of technical skill displayed. In particular, two experimental papers displaying widely differing and individual methods of expression showed a very high standard deviation of categories of assessment. The conclusion is that variability of criteria for factors other than technical skill is the reason why technical skill appears to receive undue emphasis.

I.—INTRODUCTION.

One of the aims in art education is to encourage art work displaying a satisfactory unity between the idea to be communicated and the means of communication. Art teachers frequently complain that conventional art examinations place undue emphasis on means of communication and therefore are mainly measures of technical skill. Since there can be no doubt that the examination allows for the possibility of the production of creative work, any criticism must be directed towards marking. Two explanations could account for the criticism : first, that markers have a pronounced bias toward technical skill ; second that markers generally agree in their assessment of technical skill but adopt widely divergent criteria for other factors. The second explanation, if it is correct, gives most reason for concern because assessments based on divergent criteria would tend to cancel each other and the resulting effect would be to give undue bias to technical skill, despite the intentions of the markers. Further, this bias would occur whether the results are in the form of a combination of several assessments or invididual assessment. The bias may not be obvious in the latter case but can be detected when markers are asked to make a re-assessment.

Increasing awareness of the importance of creativity underlines the need to know if evidence of technical skill is sufficient to ensure examination success and, if so, is this due to marker bias or conflicting criteria ?

II.—DESIGN OF THE EXPERIMENT.

The experiment was designed to follow as closely as possible the system of marking (Ordinary and Higher grade art) practised by the Scottish Certificate of Education Examination Board. A representative selection of 50 still-life papers (the one compulsory paper common to both grades) were assigned code numbers at random, placed in numerical order and circulated amongst 10 art-teacher markers. Markers were asked to place the papers in any or all of 25 ' bands ' (or categories of assessment) based on their own interpretation of ' general excellence ' and to indicate the paper or papers considered a ' just pass ' standard on the SCE Higher grade. Markers were also asked to state briefly their interpretation of ' general excellence ' on which they based their marking.

To compare marking by art experts and non-art experts, nine secondary teachers of general subjects and one pharmacist, all disclaiming expert knowledge of art, agreed to assess the papers. As it was unrealistic to expect these markers to appreciate the standard required from H grade candidates they were not asked to indicate a pass band. The mean pass rate of the expert markers (19 papers out of 50) was used to determine passes for both groups. One year after assessment four of the expert markers were persuaded to re-assess the papers as a check on the reliability of their assessments.

III.—RESULTS.

The assessments of the markers showed some consistency but also a substantial measure of disagreement. Table 1 shows that only three papers (Nos. 1, 9 and 15) were rated as passes and 10 papers (Nos. 17, 20, 22, 27, 28, 29, 30, 31, 41 and 43) as fails by all 10 expert markers. Papers 1, 9 and 15 were papers which displayed a high standard of technical skill; and the 10 papers which were agreed fails were clearly lacking in technical skill. Agreement among the expert markers can be assessed from Table 2.

TABLE 1

NUMBER OF TIMES EACH PAPER WAS RATED A PASS BY EXPERT AND NON-EXPERT MARKERS.

Paper No.	1	2	3	4	5	6	7	8	9	10	11	12	13
Expert Markers	10	5	7	3	4	3	5	8	10	7	9	4	8
Non-Expert Markers	7	9	5	2	4	9	5	9	9	4	10	6	7

Paper No	14	15	16	17	18	19	20	21	22	23	24	25	
Expert Markers	4	10	9	0	1	3	0	5	0	3	1	3	
Non-Expert Markers	1	6	9	4	0	0	0	8	0	3	4	1	

Paper No.	26	27	28	29	30	31	32	33	34	35	36	37	38
Expert Markers	7	0	0	0	0	0	3	4	6	7	6	2	2
Non-Expert Markers	10	5	0	0	1	1	6	2	5	2	5	0	1

Paper No.	39	40	41	42	43	44	45	46	47	48	49	50	
Expert Markers	2	2	0	1	0	9	1	2	3	3	1	9	
Non-Expert Markers	0	0	0	2	1	8	6	0	3	1	0	10	

Expert marker reliability between first assessment and second assessment one year later is shown in Table 3.

In effect about one-sixth to one-third of all papers are likely to fail on re-assessment by the above markers. However, the most important result of re-assessment was that the three certain passes on first assessment remained certain passes on second assessment with an average band shift of only 1·5 (paper 1), 2·5 (paper 9) and 1·5 (paper 15), and the 10 agreed fails remained fails.

Rank correlation, of the number of times a paper was rated as a pass, between the two groups of markers was 0·72 (cf. Table 1). This level of agreement is about the same as that shown in the best re-marking by the expert markers (Table 3). Since non-experts are perfectly able to recognise realism this substantial measure of agreement could be explained if one assumes that both expert and non-expert are giving most weight to technical skill in portraying realism.

TABLE 2

COMBINED ASSESSMENT OF EACH PAPER BY EXPERT MARKERS.

Mean Rank	1	2	3	4	5=	5=	7	8	9	10	11	12	13
Paper No.	15	1	9	44	16	11	50	13	8	10	35	34	36
Range of Bands	5	9	8	9	8	14	10	8	10	11	8	6	19
Standard Deviation	1.76	2.60	2.40	3.08	2.88	5.39	2.10	3.21	3.79	3.28	2.88	2.22	6.15

Mean Rank	14	15	16	17	18	19	20=	20=	22	23	24	25	
Paper No.	7	26	3	6	2	12	23	33	21	14	5	47	
Range of Bands....	13	15	15	16	13	11	9	4	18	13	9	11	
Standard Deviation	4.14	5.03	4.89	4.64	4.71	3.49	2.84	2.46	5.50	4.28	3.29	3.44	

Mean Rank	26=	26=	26=	29	30	31	32	33=	33=	35	36	37	38
Paper No.	4	32	48	25	45	38	24	19	39	37	40	42	31
Range of Bands....	14	12	19	12	19	8	12	15	12	15	15	13	14
Standard Deviation	4.76	3.70	6.05	4.47	5.32	3.13	3.91	5.00	4.21	5.19	5.03	3.87	4.39

Mean Rank	39	40	41=	41=	43=	43=	45	46	47	48	49	50	
Paper No.	41	46	27	17	30	43	49	20	18	22	28	29	
Range of Bands....	14	19	13	15	10	12	15	9	14	6	12	10	
Standard Deviation	5.10	6.42	4.17	4.60	2.94	3.52	4.88	3.18	5.06	2.32	3.97	3.87	

TABLE 3

RELIABILITY OF EXPERT MARKERS.

Markers' Code Letter	E	F	G	I
Nos. of papers passed on both assessments out of 19 passes	15	16	14	13

IV.—ANALYSIS OF FOUR PAPERS.

The papers of particular interest are paper 15 (passed by all experts with lowest standard deviation) and paper 22 (failed by all experts again with lowest standard deviation) and the two papers painted specially for the experiment with a definite emphasis placed on individual expression—papers 45 and 48.

Paper 15 shows a virtually achromatic, very close tone still-life, below eye-level, consisting of a light grey background against which a white plate with two white eggs, a milk bottle three-quarters full of milk and a white enamelled frying pan all rest on a newspaper. This is a very difficult technical exercise, because of the lack of hue and saturation, the extremely restricted brightness range and, because all the objects have simple contours, any inaccuracies will be obvious. If then a candidate produced a realistic interpretation of this still-life it could only be achieved by considerable technical skill.

Paper 15 is very realistic. The objects have been accurately drawn, the narrow brightness range has been accurately reproduced and the surface appearance of all the objects is credible. In short, considering the media and time available, this paper can hardly be faulted on any technical point.

Paper 22 shows a palette, daubed with paint, lying on its edge against a white drape partially covering a grey background. In front of the palette a white bowl, containing bananas, rests on a pale yellow cloth. To one side stands a yellow brown bottle and in front of this a small stoneware jug with a brown band across the top half. In front of the bowl is a partly peeled banana. Once again the objects are well below eye-level. This still-life allows freedom of interpretation, not possible in the former, due to extended range of hue, brightness and saturation and a less pre-determined size relationship between objects.

Paper 22 has not been accurately drawn. All the cylindrical objects have the same fault in perspective (showing the tops as ellipses while the bases are straight lines). Furthermore the ellipses are not consistent, indicating that the candidate has not been able to determine the correct eye-level relationship. The irrelevant indentations of the contours of the objects indicate that the candidate could not define shape, nor control the media. The wide colour contrast has been misused and handling of the paint is confused. If realism is accepted as the criterion then paper 22 displays a large number of clearly recognisable technical faults.

Two candidates painted papers 45 and 48 without the SCE in mind and given complete freedom of expression. Both candidates had previously proved themselves capable of producing work displaying three-dimensional accuracy but for the experimental still-life tried individual methods of expression. Paper 45 was executed in very thick impasto, using a painting knife, with wide colour contrasts between objects, the surface of each object being kept tonally flat, relying on paint texture and colour to provide interest. Paper 48 also displayed very wide colour contrasts but the surface of the objects was broken up into freely designed flat areas of colour, a number of these areas being very clearly defined by a hard edge. Both papers were failed by the majority of expert markers (Table 1), although, within the same month that paper 45 was painted, the candidate concerned failed Higher grade art but passed GCE A-level art and is now attending a college of art with above average success. Without doubt markers adopted conflicting criteria ; this is clearly indicated by the very wide band ranges and high standard deviations (Table 2). The actual range of marks represented by the bands varies between 4 per cent and 80 per cent for paper 48 and 0 per cent and 76 per cent for paper 45.

With the above analysis in mind, consider the claims made by expert markers as to their interpretation of ' general excellence.' Seven markers rate sensitivity, expression, visually exciting painting, ' feel ' of the group, and accentuation of *two*-dimensional pattern, as most important, with technical skill rated least important, two markers claimed to have balanced technical skill against other factors, and one marker made no comment.

Two facts emerge : first, markers claim to identify at least two factors—technical skill and some other ; second, technical skill is rated least important by the majority of markers. If the claims made by the markers are respected, then the undoubted success of papers displaying superior technical skill must be due to uniform criteria for technical skill and conflicting criteria for factors which could be loosely classed as creative.

V.—CONCLUSIONS.

Criteria for technical skill are mainly objective—dependent on well established techniques (western perspective, chiaroscuro, etc.). Although nine of the ten experts markers acknowledged that they gave due consideration to technical skill the majority claimed that technical skill was the least important factor influencing their marking. However, internal evidence indicates that proof of technical skill is sufficient to ensure a pass in still-life painting, on the Higher grade of the SCE art examination, and outweighs other factors. Further, although from one -sixth to one-third of all papers rated as ' pass ' on first assessment were rated as ' fail ' on re-assessment, the papers displaying highest technical skill remained certain passes. The conclusion is that conflicting criteria for factors other than technical skill is the reason why technical skill appears to receive undue emphasis.

It is essential that creative art work should be encouraged and that every effort should be made to establish uniform criteria for creativity. Nevertheless technical skill is a necessary element in art work and therefore it might be advisable to consider the still-life paper as a valid measure of such skill. If this procedure were to be adopted, candidates, teachers, and markers would be able to place greater reliability on assessments.

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ASPECTS OF THE SWING FROM SCIENCE

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SUMMARY. An investigation of the present and former career choices of 338 students entering the University of Bradford in 1967 indicated that students of science and engineering had made earlier and more stable decisions than students of social science about their present career intentions. Almost a half of the students of social science had wanted a science-based career at some stage of their school lives. A half of these had swung away from science by the age of 15 through declining interest; the other half swung after the age of 15 mainly through inadequate performance in the relevant subjects. But these ' deserters ' were of good academic quality in terms of A-level examination results. The personal influence of teachers, and even ' bad teaching,' were not recalled as principal reasons for turning away from science-based occupations. Among the students of engineering a high proportion were ' escalators ' who had progressively raised their ambitions from machinist or draughtsman to graduate engineer.

I.—INTRODUCTION.

The Dainton Report (HMSO 1968) gave statistical evidence of the swing away from science: the decline in the proportion of sixth-formers taking science subjects since 1962, and the decline in absolute numbers since 1964. The report reached the conclusion that " the swing away from science can arise from a complex variety of factors, and no single remedy is likely to redress the balance " ; but " attractiveness and relevance of science as it is widely presented in the middle stages of secondary education " was considered a probable major cause of the swing.

Research into pupils' academic preferences has focused on those circumstances which promote interest in different school subjects. In particular, the influence of teachers has been investigated. The evidence is conflicting. A number of studies have pointed to the comparative unimportance of teachers, at least in any direct sense. One concluded that " the power of appreciating a subject irrespective of the person teaching it was very much a characteristic of the (15-year-old) boys who liked science and maths." (Rowlands, 1961) ; another that " the attitudes of the pupils and science teachers to one another are found not to be an important factor " in pupils' preferences (Meyer and Penfold, 1961) ; a third that it was " the nature of the subjects the pupils took rather than teachers or fellow pupils that had the greatest effect" (Kelley, 1961). But one inquiry with pre-sixth form pupils reached a contrary conclusion: " the acceptability of the teacher to the adolescents was of major importance in their preference for a subject" (Pheasant, 1961). Yet another study concludes that career choices, but not necessarily attitudes to school subjects, are considerably influenced by teachers (Chown, 1958).

Interest in a subject may not be a sufficient reason for choosing it when a choice has to be made. Various inquiries have found that the quality of O-level examination results, and the sense of " not being good at a subject" (even though the pupil still liked it) were frequent reasons for dropping it (Lewis, 1963; Chown, 1958). But interest in science tends to arise early, commonly by the age of 12 or 13 (Meyer and Penfold, 1961; Kelley, 1961; Terman, 1955) and, once aroused, tends to persist (Hookham, 1965). The vocational implications of science are appreciated early (Rowlands, 1961), but by the time young people enter the university there may be a growing conviction that the future is bright for those who are really good at science, but unpromising for the average student. Thus, even at the university, a swing against science may occur when the structure of courses makes this possible (Iliffe, 1966).

II.—THE NATURE OF THE INQUIRY.

In order to make a further contribution to these studies, an inquiry was conducted among freshmen entering seven schools of the University of Bradford in 1967. The subjects were 338 students of mechanical engineering (48), chemical engineering (80), civil engineering (53), electrical engineering (63), physics (20), chemistry (24) and social sciences (50). Each student was asked to write down " the job you wanted at the age of 12, 15, 17 and now." These ages were selected because 12 would normally be the first year of the grammar school, 15 the year before O-level examinations, 17 the year after. Each student was given a list of 12 reasons for changing an occupational choice (see Table 4). These had been derived from interviews with 50 freshmen in the previous year's intake. Each student was instructed: " If you changed your job preference give the most important reason for this change. Give the number of the reason in the list. If the reason is not in the list, please write it in."

Each job-choice mentioned was placed in one of three categories: I. " Fantasy/Glamour" if it was clearly an unrealistic choice such as spy or astronaut; II. " Science-based" if it would require a predominantly scientific education, such as surveyor or veterinary surgeon; III. "Arts-based" if it would probably require a predominantly arts or social science background, such as journalist or social worker.

Each student was given a 'stability score' based on the extent to which he had changed his occupational choices from the age of 12 until the present. The same choice given on four occasions received a score of zero. A change from an arts-based to a science-based choice (or *vice versa*) was given a score of 10 points; 6 points were given for a change within the broad field of arts or science (for instance from chemist to electrical engineer); 3 for a change within a sub-division of the field (for instance from chemical to mechanical engineer). A late change was regarded more seriously than an early change and two bonus points were therefore awarded for any change between the age of 17 and entering the university. The highest score obtained was 15 the lowest zero. A score within the range 0–7 was classified as 'stable,' within the range 8–15 as 'unstable.'

Many students had aspired to more prestigeful jobs, requiring higher qualifications, as they grew older. Each student was classified as an 'Escalator' or 'Non-escalator.' An escalator was a person who at any age changed his preference from a job which would not normally require a university degree to a job in the general area that did, for example, a change from draughtsman to graduate engineer.

III.—RESULTS.

Significantly more students of science and engineering than of the social sciences had high stability scores. The comparison is given in Table 1.

TABLE 1

STABILITY SCORES BY AREA OF STUDY.

Students	High Scorers		C.R.	P
	N	%		
Science and Engineering (N. 288)	208	72·2	3·68	0·01
Social Science (N. 50)	23	46·0		

When they looked back over their school careers, students of science and engineering recalled an earlier choice of their present job preference and were less inclined to be still undecided. They appeared to be earlier and firmer deciders, as shown in Table 2.

TABLE 2

AGE OF ARRIVING AT PRESENT JOB CHOICE.

	Choosing Young (at 12 or 15)	Choosing Late (at 17 or now)	Still Undecided
Social Science (N. 50)	11 (22·0%)	30 (60·0%)	9 (18·0%)
Science and Engineering (N 288) ..	92 (31·9%)	177 (61·5%)	19 (6·6%)

Chi-square=8·07 d.f.=2 p<0·02.

Approximately 16 per cent of job preferences recalled for age 12 were fantasy-glamour choices. They were equally distributed among students of science, engineering and social science. They had diminished sharply by age 15, as shown in Table 3.

TABLE 3

FANTASY/GLAMOUR CHOICES.

Age	Total Choices	Fantasy Choices	%	Z*	P
12	162	27	16·6		
15	258	15	5·8	3·54	0·01
17	314	12	3·8	0·77	NS

* McNemar's critical ratio for correlated data.

The most common reason given for a change of job choice was " realising that it did not offer what you want in the way of interest." Self-understanding was another major reason, closely followed by an appreciation of material conditions and rewards. " Poor teaching in the necessary school subjects " was given as a reason for change by only 5·3 per cent of the students. Table 4 gives the frequency with which the 12 reasons were checked.

TABLE 4

PERCENTAGE OF ALL STUDENTS (N. 338) CHECKING EACH ITEM AS A REASON FOR GIVING UP JOB CHOICES.

Rank Order	Item	Per cent Checking
1	Realising that it does not offer what you want in the way of interest	34·9
2	Realising that you're not really the kind of person for that sort of job	25·4
3	Realising that the job does not offer what you want in material terms of pay and conditions of service	20·7
4	The fact that you lost interest in the necessary school subjects (though you might be doing well in them)	10·9
5	The fact that you were not doing well (and had perhaps failed examinations) in the necessary school subjects	10·7
6	Advice of teachers	7·1
7½	Advice of parents	5·3
7½	Poor teaching in the necessary school subjects	5·3
9	Finding you don't like the people who usually do that sort of job	4·4
10	The necessary school subjects not taught in your school	3·6
11	Realising that it does not offer what you want in social standing and prestige	3·0
12	Influence of friends	2·4

Only 5 per cent of the students of science and engineering declared an earlier interest in an arts-based occupation, but almost a half (44 per cent) of the social science students indicated that they had previously wanted a science-based job (Table 5).

TABLE 5

SWING FROM SCIENCE-BASED TO ARTS-BASED AND ARTS-BASED TO SCIENCE-BASED CAREERS.

Age	Science and Engineering (N. 285)		Social Science (N. 50)		X^2	P
	Change from arts-based to science-based career		Change from science-based to arts-based career			
	N	%	N	%		
12—15	4	1·4	10	20·0	32·6	0·01
15—17	9	3·2	8	16·0	12·2	0·01
17—now	1	0·3	4	8·0	12·2	0·01
Totals	14	5·0	22	44·0		

Ten of the 22 who had abandoned a science-based career did so (in retrospect) between the age of 12 and 15 : the major reasons were loss of interest in the type of job and the necessary school subjects. The other 12 students changed between the age of 15 and the time of the inquiry : the major reason now was academic performance (Table 6).

TABLE 6

REASONS GIVEN BY 22 STUDENTS OF SOCIAL SCIENCE FOR GIVING UP AN EARLIER SCIENCE-BASED CAREER CHOICE.

Age	Number Changing	Reason	N	%
12—15	10	The fact that you lost interest in the necessary school subjects (though you might be doing well in them)	7	70·0
		Realising that it does not offer what you want in the way of interest	3	30·0
15-present	12	The fact that you're not doing well (and have perhaps failed examinations) in the necessary school subjects	6	50·0
		Realising you're not really the kind of person for that sort of job	2	16·6
		Poor teaching	2	16·6
		The fact that you lost interest in the necessary school subjects	2	16·6

Four of those who had swung against science had previously wished to be engineers; three had wished to be research chemists. The largest group were 10 who had wished to be doctors. The majority of these (seven) gave up the idea after the age of 15, three because they were doing badly in the necessary academic subjects. The other reasons for giving up medicine were: realising you're not the kind of person for the job (3), and loss of interest in the type of work or the relevant school subjects (4).

These students who had swung away from science were not weak students as assessed in conventional terms of A-level examination results; and they were a good deal stronger in these terms than some groups of engineering students. Sixteen (73 per cent) of these 22 students had obtained three A-level passes, six (27 per cent) had obtained two. The corresponding percentages for the other social science students were 75 and 25. Students of civil engineering had comparable A-level results (75 per cent with three A-levels 25 per cent with two); only 17 per cent of the students of mechanical engineering had three A-level passes 25 per cent had two; the balance (58 per cent) had ONC qualifications.

Students whose ambitions had risen in the pre-university years were principally in the field of engineering. Only 4·5 per cent of the physical scientists were 'escalators,' 8·0 per cent of the social scientists, but 22·1 per cent of the engineers. Within the field of engineering, escalators were found most frequently among mechanical engineers (43·7 per cent), least among chemical engineers (11·2 per cent). Seventeen of the 21 escalating mechanical engineers had previously wished to be draughtsmen.

Escalation of ambition was significantly related to social class background (as indicated by father's occupation on the Registrar-General's occupational scale). Students of engineering who came from classes three, four and five, were over-represented among those whose earlier modest ambitions had risen (Table 7).

TABLE 7

SOCIAL CLASS AND ESCALATION AMONG STUDENTS OF ENGINEERING.

R-G'S " Social Class "	I—II	III—V
Escalators	15 (28·3%)	38 (71·7%)
Other engineers	86 (46·7%)	98 (53·3%)

Chi-square=5·6 d.f.=1 $p < 0{\cdot}02$.

Escalators, like other changers, mentioned the interest of the job most frequently as the reason for change ; but they mentioned almost as frequently the material rewards and conditions of the job (Table 8).

TABLE 8

MAIN REASONS GIVEN BY 'ESCALATORS' FOR GIVING UP EARLIER JOB CHOICES.

Reason	Number Mentioning
Realising that it does not offer what you want in the way of interest	23
Realising that the job does not offer what you want in material terms of pay and conditions of service	19
Realising that you're not really the kind of person for that sort of job	7
Realising that it does not offer what you want in social standing and prestige..	7

IV.—DISCUSSION.

Almost a half of the 50 students of social science who entered the University of Bradford in 1967, had wished at some time in their school careers to enter science-based occupations. Those who had changed their minds early (almost half of the changers) appeared to have done so because of declining interest in scientific jobs and studies ; those who did so later stated poor academic performance as their main reason. But these students who were now lost to science were academically able in terms of their chosen subjects at A-level.

This inquiry tends to support those studies which indicate an early choice of scientific careers, the importance of interest in choosing subjects and jobs, and the comparative unimportance of teachers (and even of bad teaching). The influence of teachers is probably indirect, mediated through the presentation of the subject.

Escalation of ambition among students of engineering is probably a function of the general swing from science. Unexpected and even unlooked for opportunities have opened up for pupils of modest intellectual attainment and ambition. Encouraged neither by their (working class) homes nor their (modest) intellectual achievements to seek graduate qualifications, they have nevertheless come to realise that such things are possible and have adjusted their sights accordingly.

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(*Manuscript received 23rd April*, 1969)

SUMMARIES OF RESEARCHES REPORTED IN DEGREE THESES

A COMPARATIVE STUDY OF THE MENTAL ABILITY OF SEVEN- AND EIGHT-YEAR-OLD BRITISH AND WEST INDIAN CHILDREN IN A WEST MIDLAND TOWN

BY J. F. PAYNE

(*Abstract of a thesis submitted for the degree of M.A. at the University of Keele*, 1967)

I.—AIMS.

This research was designed, first to investigate the differences that may exist in the performance of two racial groups (West Indian and British) on certain commonly used standardised tests, and second, to devise a classification test of concept formation that would be as free as possible of any direct cultural bias and upon which both racial groups would perform equally well when matched for levels of vocabulary definition.

II.—SAMPLES.

Three groups matched for levels of socio-economic status were chosen : 99 West Indian immigrant children, 100 randomly selected British children and 99 British children individually matched with the West Indian children according to verbal ability.

III.—MEASURES.

(1) Crichton Vocabulary Scale.
(2) Coloured Progressive Matrices (Sets A, Ab, B).
(3) Burt (Re-arranged) Word Reading Test.
(4) A concept formation test based upon previous work by Annett (1959) and Vernon (1965) and devised to be less affected by variation in the cultural milieu than are traditional tests of ability.

IV.—METHOD.

A comparison was made between the matched groups to test the hypothesis that although West Indian immigrant children of 7–8 years would show significantly poorer performances on the vocabulary test, the non-verbal intelligence test and the word-reading test compared with British children of the same chronological age and level of socio-economic status, there would be no significant difference in the performance of the two groups on the classification test of concept formation when the two groups were matched for levels of vocabulary definition.

V.—DISCUSSION OF RESULTS.

As anticipated, significant differences were found between the two racial groups on all the standardised tests employed (p. ·005), but no significant difference was found on the classification test of concept formation. There were no significant differences between the sexes within either racial group on the vocabulary, non-verbal intelligence or concept formation tests but on the word-reading test the British and West Indian girls were significantly better than their male counterparts (p ·05).

A significant positive correlation was found between all tests and when a test of significance between r's was used, in turn, for each pair of coefficients obtained by the British and West Indian groups, only one pair was found to be significantly different. The correlation coefficient calculated for the second British group in the case of Raven's Matrices/Burt Word Reading (0·50) was found to be significantly greater than that obtained by the West Indian group (0·24) p. ·05. This difference is not easy to explain but it may be connected with Higgins and Sivers' (1958) assertion that Raven's Matrices discriminate on the basis of colour. If this is true, then Raven's Matrices are not likely to be useful for predictive purposes in the case of West Indian groups. Of the tests used, it is the classification test which seems to hold out the greatest hope of valid cross-cultural comparison. The results suggest that it is relatively free of racial bias and may provide a fruitful field for further research.

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(*Manuscript received 20th May*, 1969)

BOOK REVIEWS

De Cecco, John P. (1968). *The Psychology of Learning and Instruction.* New Jersey: Prentice-Hall Inc., pp. xii+800, n.p.

In the past Dr. De Cecco has provided us with several excellent compilations of readings so that we turn with anticipation to his own study of learning and instruction. It is obviously intended to be a major work—800 pages—with the purpose of introducing the reader " to our present knowledge about learning and teaching." It will certainly be a valuable source book of materials and provide some introductory chapters on a variety of educational topics such as verbal learning, measuring intelligence, programmed instruction, etc. A new student will find here much that is informative as he reads through the basic sections on Instructional Models and Objectives, Entering Behaviour, Instructional Procedures, Educational Innovations and Performance Assessment and Research.

Dr. De Cecco had made every effort to apply the instructional methods he is advocating. He writes an explanatory introduction for each chapter and concludes each with a summary and a problem. Yet this type of publication does raise questions about the value of the exhaustive introductory volume. For example, what historical perspective is given to the student who reads a chapter on historical models made up of the Socratic, the classical-humanist approach of the Jesuits, and the personal-developmental model of Combs and Snygg? Strange bed-fellows! Again, a whole chapter is devoted to the ' new concept ' of entering behaviour, which is defined as follows: " Entering behaviour describes the behaviours the student must have acquired before he can acquire particular new terminal behaviours." We then read later that this must be distinguished from readiness because " Readiness is the adequacy of the students' existing capacity in relation to some instructional objective." If it is necessary for a student to have such distinctions drawn to his attention there would surely be grave doubts whether he should be reading this subject. My own feeling is that this type of publication too often confuses prolixity with profundity, repetition with revelation. If an American edition has to run to 800 pages could we not have a British version saying the same thing in 200? We have too many examples where the author has not had the time to be brief, but where in all seriousness, we cannot justify the time spent in following him. This adds up to another book which will be a source of reference for students and this may be no bad thing, for its strength lies in what it has culled from many areas rather than any light from within.

Harry Kay.

Douglas, J. W. B., Ross, J. M., and Simpson, H. R. (1968). *All Our Future.* London: Peter Davies, pp. 241, 42s.

This book continues the longitudinal study of the educational progress of a sample (5,362 children) of all those born in Britain in March, 1946. A previous volume, *The Home and the School,* covered the earlier life and schooling of the children while the present book, subtitled, "A longitudinal study of secondary education," deals with their subsequent progress, recording the outcome of over 20 years' contact with the children, their families, and their schools and giving a vivid indication of what secondary education amounts to in this country.

Its arrangement is clear. Following an introductory part devoted to a description of the survey and its methods, sections are devoted to the educational process, to parents and children, and to special studies (of handedness, short sight, etc.). A certain amount of statistical data is presented in a series of appendices but on the whole the results are stated verbally in broad terms for the general reader. Recurrent themes are the effects of social class on school success, and the waste of talent that is in part a consequence of this. Many other interesting and challenging issues also receive attention.

Social class is defined in terms of the father's occupational status, taking into account also the educational background of either or both parents. The interrelatedness of these variables (occupation and educational) is again and again illustrated and underlined in the findings. Children of like ability but of working or middle-class origins increasingly diverge educationally as they grow older; middle-class children (especially upper middle-class) are more likely to go to grammar school, stay there longer, obtain better school certificates and develop ambitions which lead them, encouraged by their parents, towards the professions. The worker's (expecially the lower manual-class worker's) child achieves less at school, leaves earlier and seeks employment more in accordance with the traditions of his home than in keeping with his native ability. Though there is a tendency towards greater equality in professional recruitment than was previously the case, it remains true that in general the abler working-class child is held back by his parents and class, while the middle-class child is pushed forward. The relative achievement of 'borderline' grammar school entrants well illustrates this, as the authors show.

The section of the book devoted to special studies is of unique value as there is probably no comparable longitudinal information on their topics available. The findings, of course, have their limitations but some myths are confirmed or shaken in the results. They show (conclusively we hope) that there is no difference in attainments between right, left and inconsistently-handed children. They reveal and analyse the educational advantages of short-sightedness. They bring out the fact that 'a heavy load of illness' leading to much absence from school, does not necessarily prejudice progress. Another study of great practical significance, draws attention to the way in which uneven local provision contributes to wastage of talent.

This is clearly an important book. The specialist may fault it for its unsophisticated presentation, but as it is intended for the general reader, this is not a defect. The general reader on the other hand (including many not-so-general) will have reason to be grateful for the authors' intelligible presentation of their vast data.

O. C. SAMPSON.

DUNLOP, R. S. (1968). *Professional Problems in School Counselling Practice.* Scranton: International Textbooks, pp. 316, 110s.

This selection of 30 articles is based on a collection of readings gathered for seminar use by advanced students of school counselling at the University of Missouri at Kansas City. They focus on professionalization and allied problems in four main areas: counsellor role and function; selection training and admission to practice; competence, autonomy and professionalism of the practitioner; and ethical considerations of various kinds.

For each group of readings the editor has supplied not merely an introduction but a postscript consisting of commentaries on each of the articles. This section, somewhat coyly termed 'catharis' consists according to the blurb, of "provoking, stimulating questions, statements and reactions," designed "to generate discussion." They read more like a collection of pedestrian, uninspired random responses to ideas scattered through the articles and suggest that the writer is addressing them to a particularly dull and unenterprising audience rather than the advanced one to whom he insists the book is addressed. Unless one assumes that "advanced students and competent practitioners" of counselling in the United States are peculiarly humourless and uncreative, it is difficult to avoid the conclusion that the editor has allowed his crusading ardour to overcome his sensitivity towards his reader-clients.

It is even more difficult to accept some of the main assumptions revealed by the editor. To avoid this difficulty it would be necessary for example, to fit in with the editor's belligerent belief in the propriety of degree parading. "Why not a shingle on each teacher's classroom door, giving full name and highest degree?" Or again, it would be necessary to swallow his assumption that the only way for counsellors to gain prestige is to go into schools insisting that they are special people. On the contrary, is this not the surest way to get knocked on the head? A knowledgable reader in this country might say that the best way for a counsellor to establish himself is by being especially sensitive to every opportunity of making the teacher's job easier as a result of what he does as a counsellor. A number of Americans in this field might say much the same. So, is it the editor, or is it a cultural difference? Whichever is responsible the editor's general message does not seem to have much relevance to the practice of counselling in this country at the present time.

Though this last comment applies also to a number of articles in the selected readings, to one for example, entitled " Yes, More than Vigilantes," the book includes some useful data such as the Ethical Standards of the American Personnel and Guidance Association and a considerable number of well-written and interesting articles which deal in an informed and sensible way with questions of the kind now being considered in this country: What is the role of the School Counsellor? How is he selected? What training does he receive? What training should he receive? How are we to conceive of counselling as a profession? On the whole, however, it is not a book which the reviewer would recommend for classroom use with students here, though an instructor might find it useful as a supplementary reference.

PATRICK HUGHES.

FLAVELL, J. H. (1968). *The Development of Role-Taking and Communication Skills in Children.* London: Wiley, pp. 239, 84s.

The major aim of this book was to investigate the development in children of the " general ability to take the role of another person . . . and the more specific ability to use this understanding . . . as a tool of communicating effectively with him.' As might be expected, therefore, the book consists of the reports of a number of investigations hoping to elucidate these points. The standpoint of the authors is that of the "developmental naturalist who seeks to withhold questions of structural and causal relationships in the data examined but prefers to make first a searching but descriptive mapping out of the territory." Obviously the extent to which these aims were realised depends on the quality of the investigations. These are best considered, as is usual, under a number of headings.

Review of literature.—This is highly condensed and assumes a good knowledge of previous work in the field. If the reader has a sound basis in this area there is little new in the review, although it is a good synthesis of the main points. If he has not, it is not easy to follow. This means that for a student beginning research in this area the review is not as useful as might be expected.

Sampling.—Since there was a number of investigations of which some were admittedly exploratory it would be only fair to examine the main investigation. The sample size was disappointingly small, only 160 in all, 10 boys and 10 girls at each grade from 2 to 11. It was also somewhat homogeneous for social class and I.Q. Such restrictions make generalisation difficult and it might be objected that any ' mapping out ' is on a somewhat large-scale for a preliminary study. In addition, the highly restricted I.Q. range was somewhat unfortunate.

Test Procedures.—Several different test procedures were used to elucidate role playing in the subjects. They were ingenious games such as could be expected to hold the interest and imagination of the children. However, there was no attempt on the part of these authors to show their validity. Thus, for example, the efforts of a child to predict the story a person would tell who could see only 4 of 7 pictures (the 4 telling a different story from the total 7) are regarded as a measure of role-taking. It could well be. It could also be, it seems to this reviewer, a measure of general ability or verbal ability or a combination of these. It would appear evident that such a test needs validation. It must be *shown* to be different from tests of verbal ability or intelligence. Now the effects of homogeniety of intelligence of the sample may be seen. Thus, even if it were a test primarily of role-taking, any effects of intelligence would be marked.

Statistical Analyses and discussion of results. The statistical analyses, usually analyses of variance, are quite satisfactory and the discussions of results are interesting (especially some of the protocols) revealing the Piagetian sympathies of the authors. The general tenor of the results is not surprising however, since the authors find that both the skills they investigate increase with age.

In general, it is hard to be enthusiastic about this book since so many assumptions were made about the validity of the test procedures and because of the restricted nature of the sample. Nevertheless, it might well be a useful book for research workers in this area. PAUL KLINE.

FRAISSE, P., and PIAGET, J. (1968). *Experimental Psychology: Its Scope and Method. Volume* I. *History and Method.* London: Routledge and Kegan Paul, pp. 250, 35s.

This first volume of a projected nine volume work contains four sections The first by Fraisse deals with the evolution of experimental psychology, the second also by Fraisse with experimental method, the third by Piaget with explanation in psychology and psychophysiological parallelism, and the fourth by Reuchlin with psychological measurement. Fraisse's historical study surveys in separate chapters the growth of the experimental method in psychology in Germany, England, France, America and Russia, and, rounding off with a general overview, notes the current convergence of methods into a few well defined types and concludes optimistically, that experimental psychology has mastered its method and is equipped to take account of all the complexities of life.

In his exposition of the experimental method Fraisse covers, albeit superficially, the usual matters concerning, for example, hypotheses, design, data collection and, in three pages, the analysis of results. There is no indication in the title of the forthcoming eight volumes that there is anything more to be systematically presented under this heading.

Piaget's contribution is an excellent essay, broad in scope and clearly developed, on the types of explanation that experimental psychologists use and need. It defies a brief summary here but should certainly be studied by those who have passed well beyond the novice stage.

Reuchlin covers much the usual ground, different types of scales and methods of scoring and the associated problems of error, although only to an extent which can be generally described as introductory. This is not to say that there are not very pertinent observations throughout the chapter but that in the small space allocated, Reuchlin, like Fraisse in his second section above, cannot be both comprehensive and deep.

One ignores the occasional technical lapses of translation such as ' discrimination function' and bears, though with a quite improper irritation, the many references to the *obiter dicta* of Continental workers whose names have not hitherto been in the forefront of one's thoughts. Indeed, one is quite ashamed at one's encapsulated chauvinism. But what is not at all clear is the level of psychologist at whom this volume is aimed. The historical section is interesting as background material and the contribution of the Piaget article is already referred to. But for the most part the book assumes too much initial knowledge in some areas for it to be considered as a comprehensive teaching work of the same type, say, as Kerlinger's Foundations of Behavioural Research while elsewhere it is too elementary or brief or superficial for it to be of much service, except for flashes here and there, to the advanced worker. Possibly uncertainty of aim has been compounded with inadequate space; or possibly it is fairer to suspend judgment until the work can be seen in the entirety of its nine volumes. G. E. R. BURROUGHS.

HANDEL, G. (Ed.) (1967). *The Psychosocial Interior of the Family.* London: Allen and Unwin, Ltd., pp. 560, 65s.

A detailed study of social relationships in the distinctive small group which is the 'nuclear' family is long overdue. It is, after all a naturally-occurring social unit of considerable importance. Moreover there is already evidence (see for example, Strodtbeck's article in the present collection) indicating that one cannot in this context, assume the applicability of generalisations derived from the study of *ad hoc* groups of university under-graduates. In collecting the meagre and scattered literature which exists on the topic, this book may be regarded as the first step in an important and worthwhile venture. However, the articles in this collection, though representative, chiefly indicate the vast amount of work that remains to be done.

In choice of problems, methodology, and theoretical orientation, the approach of most of the contributors is clinical. The role of family dynamics in the etiology of various mental disorders is a major preoccupation—one which stimulates awareness of the lack of baseline data derived from normal families. Unvalidated interview and projective techniques are the principal modes of data collection, and, although there is a fair amount of discussion of methodology, most of the studies are innocent of quantification, adequate sampling procedures, or even satisfactory definition of the variables being studied. This ' flexible ' approach is defended on the grounds that premature precision might exclude the study of important variables. Part of the price which the reader has to pay for this is an exclusive reliance on the researcher's judgment in evaluating the data.

On the theoretical level, much of the writing seems to fulfil a clinical rather than a scientific purpose, providing rationales for action in a treatment situation rather than satisfactory accounts of the evidence. For example, peculiarities which we are told, occur in the families of schizophrenics are almost invariably regarded as causative factors in the illness. This extreme environmentalism may enable the clinician to take an optimistic view of this role. It is far from being the only plausible interpretation of the evidence.

There are exceptions to these general criticisms. Strodtbeck's is a well conducted enquiry and his findings are integrated with the main stream of experimental social psychology . Bott's study of conjugal roles though impressionistic in itself. has already stimulated more detailed investigation of a new and interesting sociological topic. Mishler's and Waxler's succinct analysis and critique of familiar theories of schizophrenia would, in all probability, sufficiently acquaint the non-clinical reader with a major portion of the book.

Indeed, outside clinical circles, it is difficult to see the book fulfilling the editor's intentions and becoming a text or source-book. It is too much of a pioneering venture for that. Operationalising the often vague concepts to derive testable hypotheses will involve a considerable work of translation. Testing these in a scientifically acceptable manner will require much further research. W. B. HANTON.

LEWIS, D. G. (1968). *Experimental Design in Education*. London: University Press, pp. 192, 35s.

Dr. Lewis has written an extremely valuable book on designs based upon the Analysis of Variance. After the necessary introductory material he deals with simple designs using randomly selected groups, with nesting, randomized blocks and factorial designs, with designs incorporating combinations of these and with Latin squares before finishing with the introductory chapter on the Analysis of Covariance which authors in this field seem to regard as required writing. For each design a logical and consistent pattern of exposition is followed; an introduction, an example, the arithmetic of the analysis, the model, the components analysis loading to the selection of appropriate denominator terms for F ratios and then additional points which appropriately arise from the consideration of the particular design. Thus Dr. Lewis is able to discuss modifications to each basic design, orthogonal comparisons, the advantages and disadvantages of one design over another previously presented and so on. Throughout there is a careful delineation of the assumptions underlying each model and very few risks are taken about the prior knowledge of the reader.

For those who like to be guided by such things the book can be judged as being aimed at a good M.Ed. level. It is not encyclopaedic in the sense that Winer is—though much more readable through its systematic approach—but it fills a gap among text-books directed to the teaching of the subject and is much to be welcomed. G. E. R. BURROUGHS.

MILLAR, SUSANNA (1968). *The Psychology of Play.* London: Pelican Books, pp. 288, 6s.

This book is commended, explicitly in the editorial foreword and implicitly by the gay cover design, " to all parents and teachers, as well as to students engaged in advanced studies in Psychology and the Social Sciences." The commendation is misleading: few parents and teachers would find what they expect.

Dr. Millar deals first with early, simpler approaches to possible functions of play, such as Herbert Spencer's ' surplus energy ' theory, Karl Groos's view of play as practice, and I. S. Hall's ' recapitulation theory.' She proceeds to examine ' play ' in the major psychological theories. As this is meant to serve as an introduction to the subject for non-psychologists, she gives a condensed history and description of the main psychological ' schools '—psychoanalysis, ethology, behaviour and learning theories, Gestalt and Field theories, and the developmental theory of Piaget. As she states, the problem of play is not central to any of these theories; the reader who is curious about play will probably find too much theory, and the reader primarily interested in the theories would not use this as a textbook.

A detailed consideration of the play activities of animals follows, and an attempted classification of these under four main headings. This chapter does help to clarify the problem, and the point emerges clearly that play activities cannot be dismissed as ' biologically useless ' behaviour.

The central part of the book is concerned with the development of different kinds of human play—sensory motor play including exploring and practice activities, fantasy, imitation and social play. Individual and cultural variations in play are considered at length.

A chapter on play therapy is included, discussing the theories of Freud, Melanie Klein and Anna Freud, and also making reference to the learning theorists' descriptions of therapeutic processes. There is also a clear discussion of some of the controversial issues that are involved in attempting to use play in diagnosis and treatment.

Dr. Millar's conclusion is that play is " paradoxical behaviour. Exploring what is familiar, practising what has already been mastered, friendly aggression . . . " and adds that " the apparent paradoxes of various kinds of play arise mainly in conditions which leave behaviour relatively unorganised, or before it is fully organised, integrated or streamlined."

Readers seeking practical answers to practical problems about play are unlikely to find them here. There is a great deal of material, including 400 bibliographical references, which some specialist students might well look at. But in the handling of this material, definitions and classifications are attempted only to be so qualified and sub-divided that clarity is lost, and references made to experimental work often provide only an array of conflicting evidence. EILEEN W. GORIE.

PIAGET, J. (1969). *Six Psychological Studies.* London: University Press, pp. xxii+170, 30s. 6d.

This small volume was first published in French in 1964. It consists of six articles which originally appeared in various journals and which differ widely in their date of origin.

The first article, and by far the longest, was written in 1940. It is essentially a summary of Piaget's views on mental development as of then. The remaining articles date from 1963, 1954, 1959, 1956 and 1964 (this being the order in which they are presented in this collection). Each of these covers a much narrower range of subject-matter, although, as one might expect, the emphasis is generally on the concepts of cognitive structure and equlibration. The 1963 article, by way of exception, deals with the relations between language and thought.

As well as being the longest, the first article is also the most valuable. This is partly because it is an overall summary. Partly also, it is because we find Piaget giving considerable emphasis to problems of affective and moral development, a feature which is largely absent in his subsequent writings. It is a paper which brings out some of Piaget's less recognised strengths, and in particular, his very real intuitive insights into the mind of the child. It also highlights a number of his weaknesses. There is, in particular, his too ready espousal of verbal formulations whose tendency is to foreclose problems rather than open them for research. By way of example :

> "All behaviour presupposes instruments and a technique : movements and intelligence. But all behaviour also implies motives and final values (goals) : the sentiments. Thus affectivity and intelligence are indissociable and constitute the two complementary aspects of all human behaviour " (p. 15).

And again :

> " In all behaviour the motives and energizing dynamisms reveal affectivity, while the techniques and adjustment of the means employed constitute the cognitive sensori-motor or rational aspect. There is never a purely intellectual action . . . likewise there is never a purely affective act " (p. 33).

Regardless of the partial validity of this type of formulation, it clearly provides no basis whatever for the controlled experimental study of the effect of motivation on cognition.

Contrasting the first of these essays with the remaining five, one is struck by the changes in Piaget's position, no less than by the continuity. The prepotent interest in cognition remains, but there is a certain hardening. Instead of social exchange, it is the principle of equilibration which now becomes the chief agent in promoting the formation of new structures. At the same time, the analysis of these structures is much more closely linked with a detailed logical analysis. The principal gain is undoubtedly the enormously rich body of more objective performance data inspired by the application of Piaget's logical models. But there is also some loss, in that his interest in social and motivational problems has lessened. This narrowing of interest was probably an important factor in Piaget's insistence on the independent role of equilibration in relation to maturation and learning.

Again, experimental control of associated variables is excluded from the study of cognitive development, and once more one is tempted to regard Piaget's formulations as verbal solutions. And precisely because these essays are semi-polemical theoretical summaries, while illustrative experimental results receive only passing reference, they are of little value to the non-specialist reader.

Elkind's Introduction is excellent, pin-pointing clearly the changes in Piaget's outlook and its roots in philosophy, biology and mathematical logic. Both for the sake of this introduction and because of the first essay, the book well merits a place in college libraries and on tutors' shelves. In spite of its brevity and its authority (being by the master's own hand), it cannot be regarded as a useful ' student's introduction to Piaget.'

E. A. LUNZER.

RAVENETTE, A. T. (1968). *Dimensions of Reading Difficulties.* Oxford: Pergamon Press, pp. xiv+102, cloth 21s., paper 13s.

Dr. Ravenette's book on reading failure is the first in a new series under the general title " Problems and Progress in Development." The series will adopt a multi-disciplinary approach to a number of topics grouped under three headings : Disorders of Function (into which this volume falls) ; Critical Stages of Development, and Special Situations.

Children's difficulties in learning to read provide a highly appropriate area for investigation along a variety of dimensions and Dr. Ravenette clearly delineates the various points of view involved. In successive chapters he deals with head teachers' attitudes to reading failure, possible cognitive weaknesses in the child himself, problems induced by the home and school environments, the contribution of neurologists towards the definition of dyslexia and, finally, the child's perception of himself as a reader. There are two introductory chapters on general background and the reading process and two concluding chapters of review and implications for teaching.

Dr. Ravenette is to be commended for the simple and straightforward way in which he tackles all these diverse and complex areas, reducing them to highly manageable proportions. It is perhaps inevitable that the obvious criticism has to be made, namely that the size of the book induces superficiality and inconclusiveness. Indeed, the book's failings could become its teaching strength if it were to be used as a starting point for discussion and considerably wider reading. There would, however, be more hope of achieving this desirable aim if the references given were rather less subjective and restricted than they sometimes are. M. D. Vernon's book, for example, receives only a cursory nod and is not even noted in the index. At the same time Dr. Ravenette cannot bear to ignore tempting side-issues. He concludes one paragraph (p. 26) with the sentence, " Currently in fact it (i.e., the concept of intelligence) has come under considerable attack by those workers who are concerned with creativity." Three references are then given to writings on creativity but no further explanation. If this topic is to be raised at all, it surely merits some exposition.

The final chapter is a practical one, dealing with ways in which increased understanding of why children are failing to read can help the teacher to begin to deal with the problems presented. Here Dr. Ravenette is on firm ground and many good points are made. It makes one regret that some of the other chapters could not have been written by experts in the repsective disciplines. It is too much to expect that any one writer could deal with all of the dimensions of failure with equal competence. Nevertheless, this is a useful introductory book, provided it is backed up by substantial lectures and discussions. ALICE F. LAING.

ROGER, R., SCHROEDER, W., and USCHOLD, K. (1968). *Special Education—Children with Learning Problems.* London: Oxford University Press, pp. vi+251, 51s.

This book is avowedly designed for the unsophisticated teacher of children with learning problems, these being defined by the authors in their preface as " children who deviate significantly in a negative direction from the average in their learning patterns or in their general behaviour. These children frequently are called emotionally disturbed or minimally brain-injured . . . " Later in the preface we are told that " this is a book of opinions ; no pretence is made that anything described has been verified by scientific evaluation."

Even with the lowered expectations engendered by the above remarks, this reviewer found this a very unrewarding book. The first part has some general homely comments with plenty of true but rather superficial criticisms on philosophical and organisational problems of ' special education.' The second larger section is ' the curriculum ' and here the emphasis is on processes (auditory, visual, etc.) and on programmes which aim to remedy developmental delays in these processes. This section is very muddled in its layout (and one suspects in its underlying thinking) ; it consists largely of lists of diagnostic tests and remedial programmes, with no critical selection to guide its unsophisticated readership. There is a curious mixture of theory, largely in the form of linked quotations, and practical tips to teachers, often of the order : " We have used an oversized chalk for this (introduction of writing) . . . it is sometimes referred to as railroad chalk, number 888."

There are some interesting gaps, for example out of 251 pages, Mathematics (' numbers ') gets a page and a half and this is nearly all references. There are long lists of resources (chiefly useful for American readers) and references. The book ends with case-studies which give a potted history, a trivial psychological and a comparatively detailed educational evaluation and then a remedial programme. One has to report firstly that the individual programmes have a curious similarity and secondly that no evaluation of the effects of the programme is offered.

Many teachers and perhaps psychologists will have sympathy with an approach which tries to put the emphasis on present difficulties rather than past history. But this book is a poor advocate for the cause. In seeking to avoid labelling the child they have also failed to recognise and identify with any clarity his problems. One can only recommend this text at the level of an uncritical compilation of American materials and resources in this field. DAVID EVANS.

SCOTT, J. P. (1968). *Early Experience and the Organisation of Behavior.* London: Prentice-Hall, pp. 177, 18s. 6d.

The last 20 years have seen a considerable amount of experimental investigation of the effects of early experience on behaviour. This book provides a clear and interesting introductory survey of factors in the early environment which influence behaviour. Dr. Scott outlines the general development of mammals and birds, sketches the ' periods ' of development which can be delineated, and discusses the factors in the environments of birds and mammals, including man, which have been shown to have short-term or relatively permanent effects on behaviour; he concludes his survey with a discussion of the ' principles ' of early development.

Aside from its readability the book possesses two main virtues. First, it places behaviour in a biological and evolutionary framework, an approach which is not always explicit in the writing of comparative psychologists. There has been a tendency to ignore the adaptive significance of behaviour which has given some ethologists the material to create greater barriers between animal psychology and ethology. Dr. Scott's approach makes it clear that the ethological and experimental psychological approaches are complementary. Second, Dr. Scott is prepared to speculate on the relevance of experimental findings to questions relating to methods of child rearing, without losing his grip on the limitations of cross-species generalizations.

The brevity of the book and its introductory character tend to result in oversimplification. The lack of detail (as compared, say, to Dr. Scott's earlier book, *Animal Behavior*) in the description of experimental evidence does not prevent the complexity of many of the processes from emerging, but some feeling for their subtlety is lost. The emphasis on ' periods ' of development is a useful device for organizing material but the artificiality of conceptualizing behavioural development in these terms is emphasized by the stress which Dr. Scott himself places on the dynamic and continuous nature of development. His frequent use of the concept of ' critical periods ' for the effects of environmental agents on behaviour has received some support from his own extensive work on behavioural development in dogs but not from much of the recent and current research on the effects of early experience on behavioural development in rodents. The concept, with the embryological connotations which reflect its origin in this context, is not widely accepted or considered of much heuristic value, and many workers in this area might at present prefer Dr. Denenberg's view that there are as many critical periods as there are combinations of dependent variable measures and independent variable parameters.

This book should interest students in introductory psychology courses and general readers with an interest in psychology and/or animal behaviour but a distaste for jargon. The references are arranged in two categories: general articles and reviews, and references to experiments described in the text. This seems to be a useful system for allowing an interested reader to satisfy a general or specific appetite for further information on behavioural development. Dr. Scott's book should stimulate such appetites in his readers. J. M. JOFFE.

TALLAND, G. A. (1968). *Disorders of Memory and Learning.* London: Penguin, pp. 176, 6s.

This book is one of the Penguin series on the Science of Behaviour, and is written at a level which will make it a useful introduction to memory and memory disorders for students of education and other interested non-specialists. The first four chapters are devoted to a rather general account of theories of memory and classification of the processes involved in memory (registration, recall, etc.); then there are three chapters on actual cases and types of memory disorder, and a final very brief chapter on clinical tests of memory, and the possibilities of treatment.

Criticism is somewhat inhibited by the fact that the author died soon after completing the book, and had, as a consequence, no opportunity of revising it along the lines suggested by the editor; namely, by expanding the portions dealing with Professor Talland's own work on the Korsakoff syndrome. This would undoubtedly have been an improvement, particularly if this expansion were at the expense of the first four chapters, which occupy, on the one hand, too much space relative to that given the core chapters, and, on the other hand, not enough space, with the comprehensiveness attempted, to be anything but superficial. Thus, an account is given of applications of information theory and signal detection theory, which is inevitably too brief and oversimplified to convey much understanding and also unnecessary since these concepts are not used at all by the author in the chapters on memory disorders. Surely, in a series of this sort, it should be editorial policy to leave the general introductions to separate books in the series, which would have given room in this book for more detailed case histories, and made possible the development of ideas about memory and forgetting in the light of these. Background information could be brought in where necessary as the theme is developed (or use might be made of a glossary). The general reader would then come away with more knowledge about specific memory disorders, and would also, with interesting cases to aid pigeon-holing, probably remember more about the current distinctions and generalizations that are currently being made in the field of memory.

Perhaps such a book would have resulted if the editor's suggested revision had been made; but whether or not this is so, we must at least be grateful for the accounts of memory disorders that are provided, and for this example of the author's patient analysis, and his refusal to be trapped, even in a popular book like this, into facile interpretations.

A. W. STILL.

WALL, W. D. (1968). *Adolescents in School and Society.* London: National Foundation for Educational Research, pp. 136, 25s.

This publication, a second edition of a document prepared in 1965, written in non-technical language, will be welcomed by teachers and others who work with adolescents. It is aimed at stimulating discussion, and will certainly do this, as well as providing a useful source book for students and teachers. The book summarises the results of research findings in seven chapters:

1. Theories of Adolescence.
2. Intelligence, Learning, Motivitation.
3. The Secondary School Curriculum.
4. The Sixth Form.
5. Vocational Guidance; Vocational Knowledge, Interests, Motivations in Secondary Schooling and Further Education.
6. Special Problems, Maladjustment, Delinquency and Educational Backwardness.
7. Research.

References are given at the foot of the page, there is a bibliography at the end of each chapter and in addition a bibliography at the end of the book giving general and supplementary references.

Apart from the bibliographies, the book's main value lies in the succinct and often brilliant summaries of research findings and Dr. Wall's own comments. The limitations of the book are that it omits certain aspects relevant to the title. This is inevitable in a book of only 100 pages of text and 30 pages of bibliography. Some topics are not treated at all, others barely touched upon, e.g., adolescent personality, the adolescent in the family, attitudes, religious beliefs, but what there is in this book is good, and students as well as teachers will find it very useful.

JOHN G. LANG.

YOUNG, M., and MCGEENEY, P. (1968). *Learning Begins at Home.* London: Routledge and Kegan Paul, pp. 166, 21s.

This publication of the Institute of Community Studies is a study of a junior school in the London Metropolitan area and a resolute attempt to improve communications between school and parents.

The school, in the forbidding style of 1896, is set in a neighbourhood, once middle class but now declined, which includes many immigrants (29 per cent of the children have parents who were born outside the British Isles). The fathers are mainly manual workers of various kinds and 53 per cent of the mothers are at work.

In this typical underprivileged area " where children are likely to need more parental support than they get," an initial survey was carried out to discover if there was sufficient readiness to co-operate in teachers and parents. The survey, by questionnaire and interview, made it plain that parents had few opportunities for any other than formal contacts with the school, that there was considerable ignorance and confusion about streaming and modern methods, but nevertheless, general goodwill. As one mother said, " We could help if we knew how to." Testing the children showed a marked relation between educational performance and parental encouragement.

The main study concerned five proposals : an open meeting ; private talks between parent and teacher ; meetings to discuss current school methods (a great source of worry to parents) ; home visits to parents who would not come to school ; and special meetings and interviews to understand the difficulties of immigrant parents. The successes and disappointments in this programme are described in detail, and a clear picture emerges of impediments in the interaction of home and school. There is tentative support, in the mathematical analysis of test results and items of parental behaviour and attitude, for the view that teachers, by involving parents raise the parental level of encouragement, and this augments the children's educational performance. There is also much interesting observation and reflection. The authors point out that their study could have only a limited precision but readers will find it a very good introduction to further study. More research is under way and much more is needed. Parents and teachers wishing to undertake investigations can obtain advice from The Home School Research Association to be established by the authors at the Institute of Community Studies. A. H. STEWART.

——(1965—1968). *Monographs of the Creativity Research Institute of the Richardson Foundation.* New York: Creativity Research Institute, n.p.

It is always useful to find a new source of information about research in a particular area. This is certainly true of research in creativity, where, during the last 15 years or so, a large amount of work of varying quality has been carried out in the United States, the best of it being associated with psychologists such as Guilford, Barron, Mackinnon, Torrance and Calvin Taylor.

These monographs from the Creativity Institute of the Richardson Foundation, a private organisation concerned with supporting and encouraging research in creativity, also help to convey research information. Like creativity research in general, the work described in these is very mixed. The best of it deals with the prediction of creative behaviour in scientific or managerial fields by biographical information (an approach, incidentally, stressed by P. E. Vernon in his paper on Creativity and Intelligence in Educational Research, V, 3, 1964). This is particularly well handled by Taylor, Ellison and Tucker (September, 1965) in a monograph describing the construction and validation of a 300 item multiple choice inventory intended to predict creativity in NASA scientists. The inventory covers such information as academic history, types of hobbies, parental attitudes, study habits and self ratings on independence of scientific judgment. Multiple criteria were based on a Creativity Check List and Rating Form, along with numbers of publications and patents. Of the main sections of the Scale, Adult Life and Interests predicted best, followed by, in order, Academic Background, Developmental History, and Parent and Family Life. This finding suggests strongly that such inventories would be most successful with adults and of little value below sixth form level in schools.

Two of the other monographs, by Moffie and Goodner (December, 1967) and Hinman (November, 1967), both deal with correlational studies between engineering students' potential creative behaviour as assessed 15 to 20 years previously by various rating scales, personality, intelligence and aptitude tests and creative behaviour in their present posts. Biographical inventories, by Taylor and Ellison, along with supervisors' and self ratings on creativity were also completed more recently. Of all these assessments, neither IQ nor tests of scientific aptitude predicted creative performance. But stability, self-sufficiency, dominance, the scales of the Strong Vocational Interest Blank dealing with business, sales and linguistics, along with a high achievement need as a student, all correlated positively with rated creativity, as did, indeed, the main sections of the biographical inventory.

Of the other papers, one by Britt (November, 1967), describes a colour association test of verbal creativity, i.e., writing poems based on associations to colours. These are scored on scales of fluency, elaboration and abstraction (amount of symbolic, allegorical and anthropomorphic content). The last two correlated with 9th grade students' performances in English composition. The similarity of the ' test ' to English composition itself, however, does not make this finding surprising. On the other hand, assuming a certain level of literacy in those being tested, it might become a useful test.

The outcome of ready access to such sources of information might be an increase in creative thinking about creativity. G. H. TURNBULL.

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" n.p." means " no price stated."

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